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FINAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WORK PLAN ZONES A AND B CNC CHARLESTON SC

9/6/1995

ENSAFE

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY
NAVAL BASE CHARLESTON
CHARLESTON, SOUTH CAROLINA
CTO-029

FINAL
ZONES A AND B RFI WORK PLAN

Prepared for:

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Southern Division
Naval Facilities Engineering Command
Charleston, South Carolina

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Release of this document requires the prior notification of the Commanding Officer of the Naval Base Charleston, Charleston, South Carolina.

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RFI	RCRA Facility Investigation
SAR	Supplied-Air Respirator
SCBA	Self-contained breathing apparatus
SCDHEC	South Carolina Department of Health and Environmental Control
SHSO	Site Health and Safety Officer
STEL	Short-Term Exposure Limit
SWMU	Solid Waste Management Unit
SZ	Support Zone
TIC	Tentatively Identified Compound
TDS	Total Dissolved Solids
TLV	Threshold Limit Value
TOC	Total Organic Carbon
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compounds
ZHASP	Zone Health and Safety Plan

ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AL	Action Level
AOC	Area of Concern
bgs	below ground surface
BRA	Baseline Risk Assessment
CEC	Cation Exchange Capacity
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CHASP	Comprehensive Health and Safety Plan
CMS	Corrective Measures Study
CNSY	Charleston Naval Shipyard
COC	Constituents of Concern
COPC	Constituents of Potential Concern
CRZ	Contamination Reduction Zone
CSI	Confirmatory Sampling Investigation
DQO	Data Quality Objective
DRMO	Defense Reutilization Marketing Office
E/A&H	EnSafe/Allen & Hoshall
EZ	Exclusion Zone
FID	Flame Ionization Detector
HAZWOPER	Hazardous Waste Operations and Emergency Response
IDLH	Immediately Dangerous to Life and Health
LEL	Lower Explosive Limit
μg/kg	micrograms per kilogram
μg/L	micrograms per liter
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
MSDS	Material Safety Data Sheet
NAVBASE	Naval Base Charleston
NFI	No Further Investigation
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PEL	Permissible Exposure Limit
PHSO	Project Health and Safety Officer
PID	Photoionization detector
POL	Petroleum, oil, and lubricants
PPE	Personal Protective Equipment
ppm	parts per million
PRG	Preliminary Remedial Goals
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit
RFA	RCRA Facility Assessment

1.0 INTRODUCTION

As part of the U.S. Navy Comprehensive Long-Term Environmental Action Navy Program, the following Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan has been prepared by EnSafe/Allen and Hoshall (E/A&H) for Zones A and B at Naval Base Charleston (NAVBASE). This work plan addresses sampling and analysis requirements specific to sites within Zones A and B and is intended to be used in conjunction with the *Final Comprehensive RFI Work Plan* (August 30, 1994) prepared for NAVBASE. Each Solid Waste Management Unit (SWMU) and Area of Concern (AOC) to be investigated within Zones A and B is described in Appendix A and located on Figure 1-1.

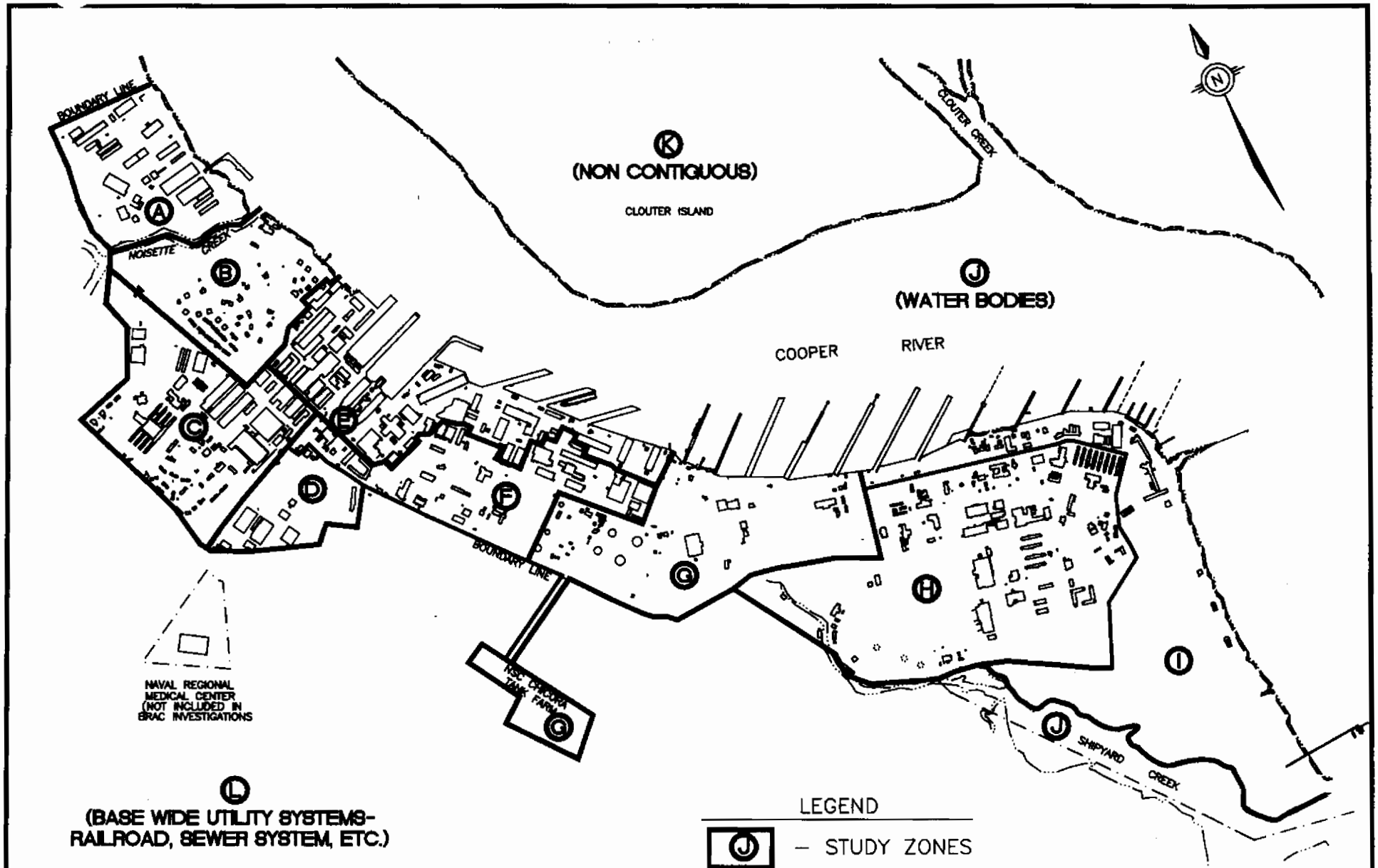
1.1 Environmental Setting

Physiography

Zones A and B are in the western most portion of NAVBASE, bordered by a Southern Railroad spur and Avenue D to the west, the Cooper River to the east, the Controlled Industrial Area and Building 234 to the south, and Hess Oil, Inc. property to the north. Noisette Creek divides Zones A and B. Figure 1-2 identifies the boundaries for Zones A and B in relation to NAVBASE boundaries and the remaining investigative zones.

Geologic and Hydrogeologic Information

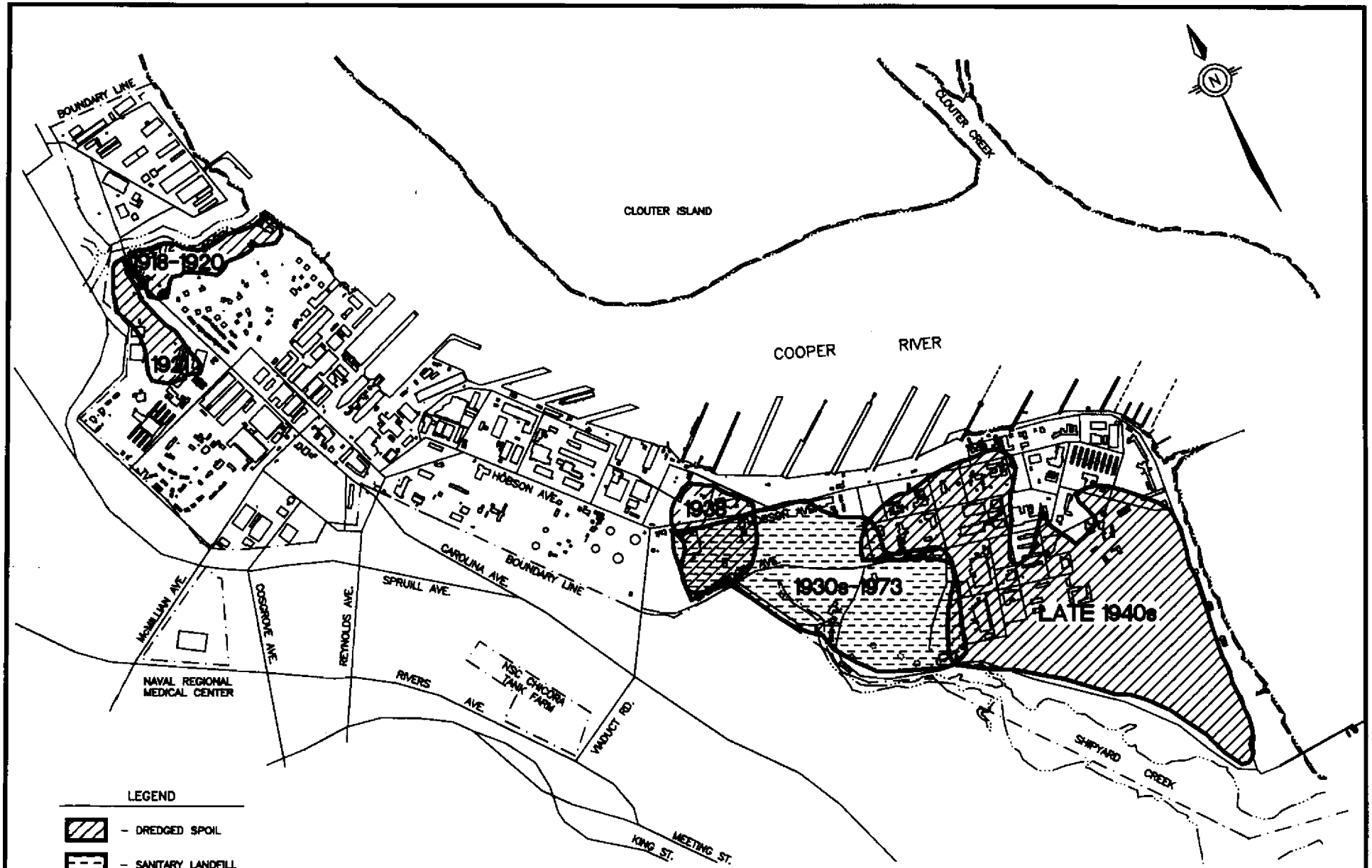
The local and regional geologic/hydrogeologic characteristics are described in Volume II, Sections 1.2 through 1.5 of the *Final Comprehensive RFI Work Plan*. The potential direction of groundwater flow for Zones A and B is to the Cooper River. However, groundwater could flow toward Noisette Creek in localized areas on both sides of the creek. Due to past and present activities, surface soils within Zones A and B have been reworked throughout the years. However, most of Zones A and B are native soil comprised of fine-grained silts, silty sands, and clays. A small portion of the northern section of Zone B is not native soil, as shown on Figure 1-3. This area was filled with dredge material from the Cooper River between 1918 and 1920.



ZONES A & B
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 1-2
BASE WIDE
ZONE BOUNDARIES

DWG DATE: 09/22/95 | DWG NAME: 29ZONEAB


BOUNDARY LINE
CLOUTER CREEK
CLOUTER ISLAND
COOPER RIVER
1916-1920
1920
HOBSON AVE.
1935
1930s-1973
LATE 1940s
CAROLINA AVE.
BOUNDARY LINE
SPRUILL AVE.
McMILLAN AVE.
COSGROVE AVE.
REYNOLDS AVE.
NAVAL REGIONAL MEDICAL CENTER
RIVERS AVE.
NSC CHICORA JAMA FARM
VIADUCT RD.
SHIPYARD CREEK
KING ST.
MEETING ST.
LEGEND
- DREDGED SPOIL
- SANITARY LANDFILL
SOURCES: SOUTHDIV, n.d. ESE, 1981.
2000 0 2000
SCALE FEET
ZONES A & B
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 1-3
AREAS FILLED AND
APPROXIMATE DATES
OF FILLING OPERATIONS
DWG DATE: 09/22/95
DWG NAME: 29FILCHA

Climatology

The climatological setting of NAVBASE is described in Volume II, Section 1.6 of the *Final Comprehensive RFI Work Plan.*

1.2 Investigative Strategy

The proposed investigative approach for each site was developed in accordance with the overall investigative strategy presented in Section 2, Volume I, *Final Comprehensive RFI Work Plan*, emphasizing a fast-track cleanup program.

Central to this idea is a phased approach to data collection that will ultimately identify constituents of potential concern (COPCs) (if present), define nature and extent of any contamination, and provide data collection for a corrective measures study (CMS). To meet these objectives, sampling methods and locations discussed in this work plan are designed to be as complete as possible.

If the proposed sampling efforts do not achieve this goal, sampling will continue until sufficient data are obtained. In order to determine the need for additional sampling not specified in this work plan, data collected under this plan will be evaluated regarding potential human health impacts expressed as preliminary remedial goals (PRGs), ecological risk, and technical requirements for a CMS. For some chemicals, additional information regarding background concentrations will be required, necessitating onsite and offsite data collection. Background concentrations, migration pathways, human and ecological receptors, and PRGs are discussed in Section 1, Volume III of the *Final Comprehensive RFI Work Plan.* Sampling will continue until the extent of contamination is determined, which is defined herein as the horizontal and vertical area in which concentrations of COPCs in the investigated media are above either PRGs or background concentrations, whichever is appropriate. Methods for calculating background in organics and inorganics will be handled outside of the Zones A and B Work Plan. Background determination is discussed further in the Baseline Risk Assessment Work Plan.

The zone-specific work plans outline the data collection process for each SWMU and AOC in the particular zones. The *Final Comprehensive RFI Work Plan* discusses how these data will be used to fulfill the investigation goals. An RFI Report and Baseline Risk Assessment (BRA) will be generated when each zone investigation concludes, and a final RFI Report and final BRA will address NAVBASE as a single entity once all zone investigations are completed.

The proposed schedule for conducting the investigation for Zones A and B is included in the *Corrective Action Management Plan* (April 21, 1995) prepared for the NAVBASE RFI. Activity scheduling during the investigation for Zones A and B will be closely coordinated with the Navy, U.S. Environmental Protection Agency (USEPA) Region IV, and South Carolina Department of Health and Environmental Control (SCDHEC).

1.3 Other Relevant Investigations

Because the Zones A and B investigation is part of a larger investigative strategy, some pathways included for investigation in Volume III of the *Final Comprehensive RFI Work Plan* that may be relevant to Zones A and B will be considered in other zone investigations.

- Sediment and surface water sampling of Noisette Creek to measure potential impact will be addressed in the Zone J investigation. Additionally, Phase I assessments of the ecologically sensitive areas within NAVBASE were conducted within the Zone J investigation. Figure 1-4 indicates the areas within Zones A and B that were identified by the Zone J study.

- The sewer systems will be addressed in the Zone L investigation.

- Groundwater flow and hydrology are dependent upon basewide conditions. Information gathered in this investigation will contribute to groundwater characterization of individual sites within Zones A and B, and will attempt to build a conceptual model of groundwater processes across both zones. For purposes of this work plan, all "shallow wells" will be completed at a depth of approximately 15 feet, and all "deep wells" will be to the top of the Cooper Marl, approximately 50 feet bgs.

- Because most of Zones A and B is native soil, it may be feasible, once the analytical data have been reviewed, to designate some onsite areas as representative of background. An offsite investigation to determine background concentrations for some chemicals relevant to the Zones A and B Work Plan may be conducted as outlined in the *Final Comprehensive RFI Work Plan*.

2.0 SWMU and AOC-SPECIFIC INVESTIGATORY APPROACH

The SWMUs and AOCs in Zones A and B requiring either a Confirmatory Sampling Investigation (CSI) or RFI activities, as determined in the *RCRA Facility Assessment (RFA)* (June 1995), are presented in the following sections and shown on the Proposed Sampling Locations Map which follows as Figure 2-1. Table A (found in Appendix A) is a reference indicating the location of each site within Zones A and B, the proximity to existing structures, and the respective site investigative approach as proposed by the RFA. The sites identified represent all known hazardous waste activity that has occurred in Zones A and B. The systematic grid sampling plan outlined in Section 3 was established with the purpose of identifying potential contamination from any sites not found in the RFA process and to collect data for the background evaluation. One site listed in the RFA is not covered in this work plan. SWMU 40, Building 1640 DRMO, is an active regulated facility that will undergo RCRA closure when its operations cease.

Radiological Potential

The Charleston Naval Shipyard (CNSY) Radiological Control Office has determined there are a number of sites within Zones A and B that have a low potential for radioactivity. CNSY will perform detailed radiological surveys at these locations and document that radioactive materials have been removed. This process may be independently verified by the USEPA and SCDHEC. These surveys are described in separate work plans and reports.

Contractor sampling at any point within Zones A and B shall not proceed until applicable Navy radiological verification surveys have been completed at the sampling location. As sampling is scheduled, and prior to sampling at any point in Zones A and B, contact the CNSY General Survey Project Superintendent to determine if the verification surveys have been completed. Once the completion of surveys has been verified, no gamma screening will be required for samples taken in the verified areas. CNSY will support EnSafe/Allen & Hoshall (E/A&H) sampling schedules by adjusting survey schedules with reasonable advanced notification.

2.1 SWMU 1, DRMO Storage, and SWMU 2, Lead Contamination Area

SWMU 1 was used by the Defense Reutilization and Marketing Office (DRMO) to store property turned in from local armed forces activities. The property includes some products which could not be reutilized by other commands and were consequently classified as waste. Those which were considered hazardous waste were stored until the early 1990s in a covered storage shed formerly known as Building 1617. SWMU 1 has received certification of health-based risk clean closure for soils. Documentation of this action is included as Appendix B. Because SWMU 1 is located within the boundaries of SWMU 2, the RFI will be conducted concurrently with the SWMU 2 RFI.

SWMU 2 consists of salvage bin No. 3 and the adjacent paved ground surface. The area was used to store recovered lead from lead-acid submarine batteries from the mid-1960s until 1984. Electrodes and associated internal metallic components were removed from the battery jars in the battery electrolyte treatment area, SWMU 5 in Zone E. Recovered materials were then placed on a railcar and transferred to the DRMO area for storage and eventual sale to a salvage contractor. Extensive sampling has been conducted at SWMU 2, and the site has been designated for an RFI because of the lead concentrations detected in surrounding media. Due to contaminant migration via surface water runoff, the investigation for SWMU 2 has been expanded to cover a large area. This area also includes SWMU 1. Topographic data collected prior to paving activities in 1994 at the site are included as Appendix C. This information was used to add arrows to Figure 2-2 that indicate the approximate direction of surface water runoff.

Table 2-1 describes both sites.

Table 2-1
SWMU 1 and SWMU 2
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
SWMU 1 DRMO Storage Area	This site is the location of a former DRMO Storage Shed, which included the storage of both nonhazardous and hazardous waste. The storage shed was a wood framed and roofed structure that was destroyed by Hurricane Hugo. The floor, which remains in place, consists of asphalt paved, and unpaved areas. Hazardous wastes were stored in containers and segregated according to type. No spills at the site were documented. SWMU 1 has been designated for an RFI.[a]	VOCs, Hydrazine, Metals, and Hazardous waste characteristics	**Soil** Soil Gas Sediment **Groundwater** Surface Water
SWMU 2 Lead Contamination Area	This site consists of salvage bin No. 3 and the surrounding area, which is paved. Lead dust from the recovery operations was released to the salvage bin by handling. Routine activities (vehicular traffic) in the DRMO yard area and natural processes (wind and storm water flow) have caused an area of lead contamination estimated to cover approximately 6 acres.[a]	Lead-acid batteries	**Soil** Sediment **Groundwater** Surface Water

Notes:

[a] Described in the *RCRA Facility Assessment, August 1987.*
[b] Pathways scheduled for sampling are bold.

2.1.1 Previous Investigations

Previous investigations of SWMU 1 culminated in the certification of clean closure for soils of the DRMO Storage Shed. However, documentation is not available to verify that sampling for the closure certification was conducted in a manner that provides data that is acceptable for risk assessment procedures.

Therefore, additional samples were collected to corroborate the results of the earlier sampling event. In the autumn of 1993, this confirmatory sampling was conducted in the vicinity of SWMU 1. Two soil borings, with two samples each, and one groundwater location were sampled for the complete TCL/TAL list. Locations of the sampling points are shown on

Figure D-2, and the analytical information is summarized in Table D-2. Also, the analytical reports from the 1993 sampling are included in Appendix E.

Extensive soil, sediment, and groundwater sampling has been conducted to delineate the extent of contamination migrating from SWMU 2. According to the *Final Contamination and Exposure Assessment for the Lead Contamination within the DRMO* (October, 1986), 71 soil samples were collected from the DRMO site; 35 samples consisted of surficial soil (surface to 6 inches) and the remaining 36 samples were collected at various depth intervals from 10 separate soil borings (total depths of 7.5 feet to 10 feet bgs). The locations of the samples are shown on Figure D-1, and the data are provided in Table D-1a.

The lead concentrations in the surficial soil varied from less than 1.3 to 371,000 milligrams per kilogram (mg/kg). Lead concentrations were greatest in the area adjacent to and in front (north) of the former battery storage bin. The concentrations decrease significantly (10 to 100 mg/kg) over a distance of several hundred feet south of the bin area. Site activities apparently had spread lead contamination over a large area, estimated at 6 acres. Additionally, storm water runoff had spread contamination along a surface drainage route immediately south and west of the bin area, toward the storm water catch basin at the east end of Building 1608A.

Soil borings were installed to characterize the vertical extent of lead contamination in the soil. The results indicate that the lead contamination is primarily confined to the surface soil. The lead concentration for each sample depth interval averaged over all 10 borings was as follows:

Depth Interval	**Lead Contamination (mg/kg)**
Surface to 0.5 feet	16,103
3 to 4.5 feet	255
6 to 7.5 feet	274
8.5 to 10 feet	509

Additionally, extraction procedure toxicity tests were conducted on two soil samples with the highest total lead concentrations, SS-26 (371,000 mg/kg) and SS-28 (107,000 mg/kg). The leachate produced from the testing contained lead concentrations above the regulatory limit of 5 milligrams per liter (mg/L), 60.8 mg/L and 113 mg/L, respectively. Any soil above 5 mg/L would be characterized as hazardous waste, if removed.

Ambient air sampling was also conducted during the contamination and exposure assessment for lead contamination within DRMO. Samples were taken outdoors, in the materials storage shed area, and indoors, in 7 buildings within the DRMO site. The results of the ambient air sampling are listed in Table C-1b. The measured ambient air lead concentrations did not exceed Occupational Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health (NIOSH), or American Conference of Governmental Industrial Hygienists (ACGIH) recommended occupational criteria (30 to 50 micrograms per cubic meter).

In the fall of 1993, another sampling event was conducted to investigate both soil and groundwater near this SWMU. This investigation was also conducted to investigate the effects of Hurricane Hugo in 1989 on the distribution of contamination. Twenty-three soil borings and six shallow monitoring wells were installed. Additionally, 11 sediment samples were collected from the Cooper River and the storm sewer system. These data are summarized in Table D-2 and shown on Figure D-2. Also, the analytical reports are provided in Appendix E.

The total lead concentration in these surface soil samples ranged from 1 to 1,400 mg/kg, and the subsurface soil range was 1.4 to 40 mg/kg. The sediment samples collected from the Cooper River upstream and downstream of the site, and at storm sewer outfalls, contained detectable concentrations of lead (3.7 to 47 mg/kg). The sediment samples from the storm sewer contained much higher concentrations (86 to 1,000 mg/kg). Also, one groundwater sample from monitoring well CNSY-02-05 contained detectable concentrations of lead

(910 micrograms per liter [μg/L]). However, lead was not detected in the sample collected from the monitoring well between the site and the river (CNSY-02-03).

The pH readings taken during collection of the groundwater samples were as follows:

Well Number	pH (2 gals.)	pH (4 gals.)	pH (6 gals.)
CNSY-02-01	6.26	5.98	5.87
CNSY-02-02	6.15	6.25	6.25
CNSY-02-03	6.35	6.31	6.29
CNSY-02-04	6.76	6.68	6.63
CNSY-02-05	5.43	5.46	5.89
CNSY-02-06	4.89	4.61	4.54

The volumes indicate amount of water purged prior to each pH reading. All data was collected on November 15, 1993. Low pH levels increase the solubility of metals in groundwater.

2.1.2 Treatment Alternatives

As outlined in the overall sampling strategy presented in the *Final Comprehensive RFI Work Plan*, treatment alternatives are being identified for the sites likely to require remedial action. Data collection efforts will support evaluating these alternatives. Tables F-1 and F-2 (Appendix F) list the treatment alternatives for groundwater and soil/sediment, respectively. Alternatives presented here are for preliminary evaluation only. If contaminants are present at concentrations requiring remediation, a CMS will be undertaken to identify feasible treatment alternatives.

2.1.3 Data Gaps

Available analytical data supports the clean closure certification for soil recommended by the health-based risk assessment for SWMU 1. Additional soil and groundwater samples will be collected to confirm that no contamination exceeding PRGs exists at SWMU 1.

The extensive data that already exist for SWMU 2 indicate migration of lead dust from this site. To ensure data collection efforts are sufficient to meet the stated investigation objectives, the following data gaps have been identified and will be resolved:

- There are insufficient data to fully delineate the extent of contamination.

- There are insufficient data to support a detailed evaluation of treatment alternatives, if necessary. The two primary sampling events conducted onsite revealed varying ranges of lead concentrations. Further sampling is necessary to verify the maximum lead concentrations in the impacted soil.

2.1.4 Potential Receptors

Potential receptors of exposure to contaminants include current land users, such as NAVBASE personnel, and any future users this area may support. Data will be generated during the RFI to determine the level of risk to the entire spectrum of current and potential users, including any highly sensitive individuals, who might be exposed through invasive or noninvasive activities at both SWMU 1 and SWMU 2.

The only known activity associated with SWMU 2 is storage of reclaimed lead. Potential receptors would likely be workers involved with any invasive activity bringing them in direct contact with subsurface contaminants. The Cooper River is potentially subject to receiving contaminated surface water runoff and groundwater discharges, resulting in exposure to biological receptors other than humans.

There is an area of localized groundwater contamination in the immediate vicinity of the lead storage bin. Considering the shallow depth to groundwater, generally less than 4 feet bgs, site workers could also be subject to accidental ingestion or dermal exposure to contaminated groundwater in this area.

2.1.5 Objective

For SWMU 1, the objective of the proposed field investigation is to assess the results of earlier sampling efforts for both soil and groundwater. The area is within the greater area affected by lead contamination by SWMU 2 and will be included in whatever action is taken to affect closure of that unit.

For SWMU 2, the objective of the proposed field investigation is to fill the identified data gaps by delineating the horizontal and vertical extent of the soil, sediment, and groundwater contamination at SWMU 2. The area has been sampled extensively as discussed in Section 2.1.1, and this effort will be used to further delineate the extent of contamination. Delineating the extent of contamination should identify any onsite point sources for lead contamination to enter the Cooper River. This information will be necessary for the ecological survey that is covered in the Zone J work plan. Data collection efforts will support technical evaluation of identified treatment alternatives.

2.1.6 Screening Alternatives

No screening alternatives are planned because this effort is chiefly designed to further delineate the extent of lead contamination throughout the SWMU 2 area. However, all soil boring samples will be screened for VOCs with a photoionization detector (PID). If the presence of chlorinated compounds are suspected, a flame ionization detector (FID) will be used instead. All screening results will be recorded in field notebooks and boring logs.

2.1.7 Sampling and Analysis Plan

To fulfill the RFI objectives, site-specific sampling and analysis requirements have been proposed. One soil boring is proposed for SWMU 1, and 29 soil borings are proposed for characterizing SWMU 2. In order to assess previous data collected for these sites, 10% of the former sampling locations will be resampled. The SWMU 1 soil boring and seven of the SWMU 2 soil borings are proposed to resample areas of interest. These locations were selected

to cover the entire horizontal extent of former sampling and to cover a large range of lead concentrations in the earlier data (3.7 to 48,600 ppm). Two former sediment sample locations will also be resampled during this investigation.

The remaining 22 soil boring sample locations were selected to verify the maximum concentration of lead in impacted soils, and to further define the extent of contaminant migration from the site.

Additionally, this sampling effort will investigate contamination due to current storage onsite. Surface water runoff enters a storm sewer catch basin approximately 100 feet southwest and topographically downgradient of the lead storage bin. This area has not been characterized by previous sampling efforts, and two of the borings are proposed for this area.

Based upon water level measurements from the 1993 investigation, groundwater flows east towards the Cooper River at a gradient of 0.0085 feet per foot. No velocity data is available at this time. The velocity calculations for Zone H indicate a range from 0.017 to 0.0012 feet per day in the shallow aquifer. However, the groundwater velocity at this site (native soil) could differ from Zone H (dredge spoils) because of the differences in the soil matrices.

Groundwater will be addressed by redeveloping and sampling the six existing monitoring wells in the vicinity of these sites. Because one of the monitoring wells will be sampled during the investigation of SWMU 38, only five groundwater samples are listed for this investigation. However, data from all six monitoring wells will be reviewed by NAVBASE, SCDHEC, and USEPA to determine whether additional wells are needed to define the extent of groundwater contamination.

Samples will be collected at two depths for each of the 30 soil borings, surface (0 to 1 foot) and subsurface (3 to 5 feet). Each proposed sampling location is illustrated on Figure 2-2.

Table 2-2 summarizes the types of samples to be collected at SWMU 2 and the analytical parameters. All sampling will adhere to the NAVBASE *Final Comprehensive RFI Work Plan* (August 30, 1994).

Table 2-2
SWMU 1 and SWMU 2
Sampling Plan

Matrix	Quantity	Analysis
Soil (0-1' bgs)	30	Metals for all samples.
Soil (3-5' bgs)	30	SWMU 1 samples will also be analyzed for VOCs, SVOCs, Pesticides, PCBs, and Cyanide.
Sediment	2	
Groundwater (Shallow well)	5	

Engineering Parameters:

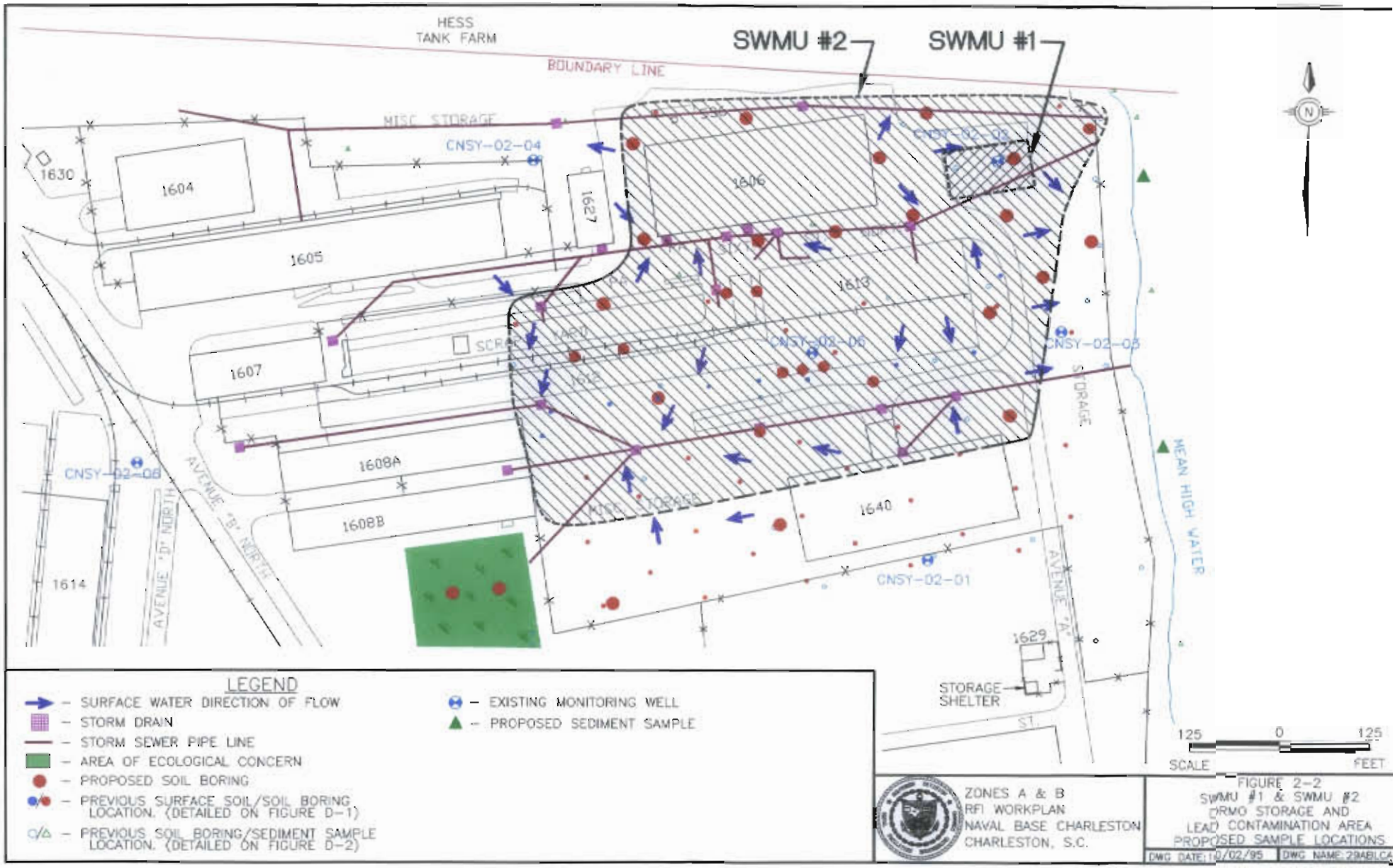
Selected soil samples will be tested for permeability, grain size, porosity, total organic carbon (TOC), and cation exchange capacity (CEC).

Notes:

Groundwater monitoring wells will be sampled quarterly for one year.

The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion may be necessary to meet the stated objectives.

All analyses will be performed per SW-846 except where other methods are specified. Data Quality Objective (DQO) Level III analyses will be performed as specified in *Final Comprehensive RFI Work Plan*, with a minimum of 10 percent duplicates analyzed for all Appendix IX constituents at DQO Level IV. The sample quantities presented do not include quality assurance/quality control (QA/QC) samples.


HESS
TANK FARM
BOUNDARY LINE
SWMU #2
SWMU #1
MISC. STORAGE
CNSY-02-04
CNSY-02-03
CNSY-02-06
CNSY-02-05
CNSY-02-08
CNSY-02-01
1630
1604
1605
1627
1606
1613
1607
1608A
1608B
1614
1640
1629
AVENUE "B" NORTH
AVENUE "D" NORTH
AVENUE "A"
STORAGE
MEAN HIGH WATER
STORAGE SHELTER
ST.
N
125
0
125
SCALE
FEET
LEGEND
– SURFACE WATER DIRECTION OF FLOW
– STORM DRAIN
– STORM SEWER PIPE LINE
– AREA OF ECOLOGICAL CONCERN
– PROPOSED SOIL BORING
– PREVIOUS SURFACE SOIL/SOIL BORING LOCATION. (DETAILED ON FIGURE D-1)
– PREVIOUS SOIL BORING/SEDIMENT SAMPLE LOCATION. (DETAILED ON FIGURE D-2)
– EXISTING MONITORING WELL
– PROPOSED SEDIMENT SAMPLE
ZONES A & B
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 2-2
SWMU #1 & SWMU #2
DRMO STORAGE AND
LEAD CONTAMINATION AREA
PROPOSED SAMPLE LOCATIONS
DWG DATE: 10/02/95
DWG NAME: 29ABLCA

2.2 SWMU 38, Miscellaneous Storage, North of Building 1605

SWMU 38 is the site of a former storage yard associated with Buildings 1605 and 1604 for approximately 50 years. Little is known about the materials previously stored onsite, which is near the northern boundary of NAVBASE. The Hess Oil, Inc., tank farm is adjacent to this boundary. Therefore, the CSI designated for this site will also assess potential petroleum releases from the offsite tanks.

The boundary of SWMU 38 was reduced in this work plan to encompass the specific area formerly used for the storage of empty drums. The remaining area depicted in the RFA has only been used for the storage of wooden pallets, boats, and automobiles. Storage of these items would not be expected to result in significant releases to the environment. Table 2-3 describes SWMU 38.

Table 2-3
SWMU 38
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
SWMU 38 Miscellaneous Storage, North of Building 1605	This site is a former storage area for unknown materials. The gravel storage area, bordered by a chain-link fence, originally belonged to the supply department and later became part of the DRMO. The DRMO used the site to store empty drums. It is north of Building 1605, near the northern boundary of NAVBASE. The Hess Oil, Inc., tank farm is close to this site.[a]	VOCs SVOCs Metals PCBs	**Soil** Soil Gas **Groundwater** Air Surface water

Notes:

[a] Described in the *Final RCRA Facility Assessment, Volume II, June 6, 1995.*
[b] Pathways scheduled for sampling are bold.

2.2.1 Previous Investigations

This site has not been investigated previously. However, as part of an investigation of SWMU 2, a monitoring well was installed in 1993 to the south of SWMU 38. This well (CNSY-02-04) was analyzed for metals, and the results were below the respective method detection limits.

2.2.2 Treatment Alternatives

Because there are no environmental media data, treatment alternatives for this site cannot be evaluated.

2.2.3 Data Gaps

Currently no environmental media data have been collected at SWMU 38 to characterize the site or to support a detailed evaluation of treatment alternatives, if necessary. To ensure data collection efforts are sufficient to meet the stated investigation objectives, the following data gaps have been identified and will be resolved:

- There are no data to establish whether constituents of potential concern (COPCs) are present for any of the potential migration pathways.

- No data exist to support a detailed evaluation of treatment alternatives, if necessary.

2.2.4 Potential Receptors

Potential receptors that may be exposed to site contaminants include current land users, such as NAVBASE personnel, and any future users this area may support following closure. Data will be generated during the investigation to determine the level of risk to the spectrum of current and potential future receptors, including any highly sensitive individuals within the population, who may be exposed through invasive or noninvasive activities. Sampling will characterize the potential pathways highlighted in Table 2-3.

Land near SWMU 38 is used for vehicle parking and miscellaneous storage. Therefore, vehicular and pedestrian traffic frequents this area. Potential receptors are site workers involved with invasive activity, such as utility maintenance, bringing them in direct contact with subsurface contaminants. Considering the shallow depth to groundwater, generally less than

4 feet bgs, site workers could also be subject to accidental ingestion or dermal exposure to contaminated groundwater.

2.2.5 Objective

The goal of the CSI is to classify the site as NFI or RFI by using Data Quality Objective (DQO) Level III or IV data to determine whether COPCs are present. Additionally, data will be collected to determine if potential releases from the adjacent Hess Oil tank farm have impacted NAVBASE property. If an RFI is required, the objective of field investigations shall be to fill the identified data gaps by delineating the horizontal and vertical extent of any soil and/or groundwater contamination as well as the rate of contamination migration at the sites. Data collection efforts will also support the technical evaluation of identified remedial options.

2.2.6 Screening Alternatives

No sampling has been conducted to determine COPCs; therefore, selecting a screening alternative would be premature. If the proposed collection of the high-quality samples is inadequate to define the areal extent of contamination (if present), the feasibility of employing screening methods will be re-evaluated. However, all soil boring samples will be screened for VOCs with a PID. If the presence of chlorinated compounds are suspected, a FID will be used instead. All screening results will be recorded in field notebooks and boring logs.

2.2.7 Sampling and Analysis Plan

To fulfill the CSI objectives, the following site-specific sampling and analysis requirements have been proposed for SWMU 38. Table 2-4 summarizes the types of samples to be collected and the analytical parameters. Four soil borings are proposed to detect the presence of any contamination from either SWMU 38 or the Hess Oil tank farm. Additionally, two shallow monitoring wells will be installed: one along the NAVBASE/Hess Oil boundary line, and one in the upgradient direction. Additionally, a deep monitoring well will be installed alongside the upgradient shallow well. These well locations will provide information regarding potential

groundwater contamination from either site. The existing monitoring well downgradient (east/southeast) of the site will also be sampled during this investigation.

Samples will be collected at two depths for each of the soil borings, surface (0 to 1 foot) and subsurface (3 to 5 feet). The proposed sampling locations are illustrated on Figure 2-3. All sampling will adhere to the NAVBASE *Final Comprehensive RFI Work Plan* (August 30, 1994).

Table 2-4
SWMU 38 and Hess Oil Tank Farm
Sampling Plan

Matrix	Quantity	Analysis
Soil (0-1' bgs)	4	VOCs and Semivolatile Organic Compounds (SVOCs) w/ Tentatively Identified Compounds (TICs), Metals, Pesticides, and Polychlorinated Biphenyls (PCBs).
Soil (3-5' bgs)	4	
Groundwater (Shallow well)	3	
(Deep well)	1	

Engineering Parameters:

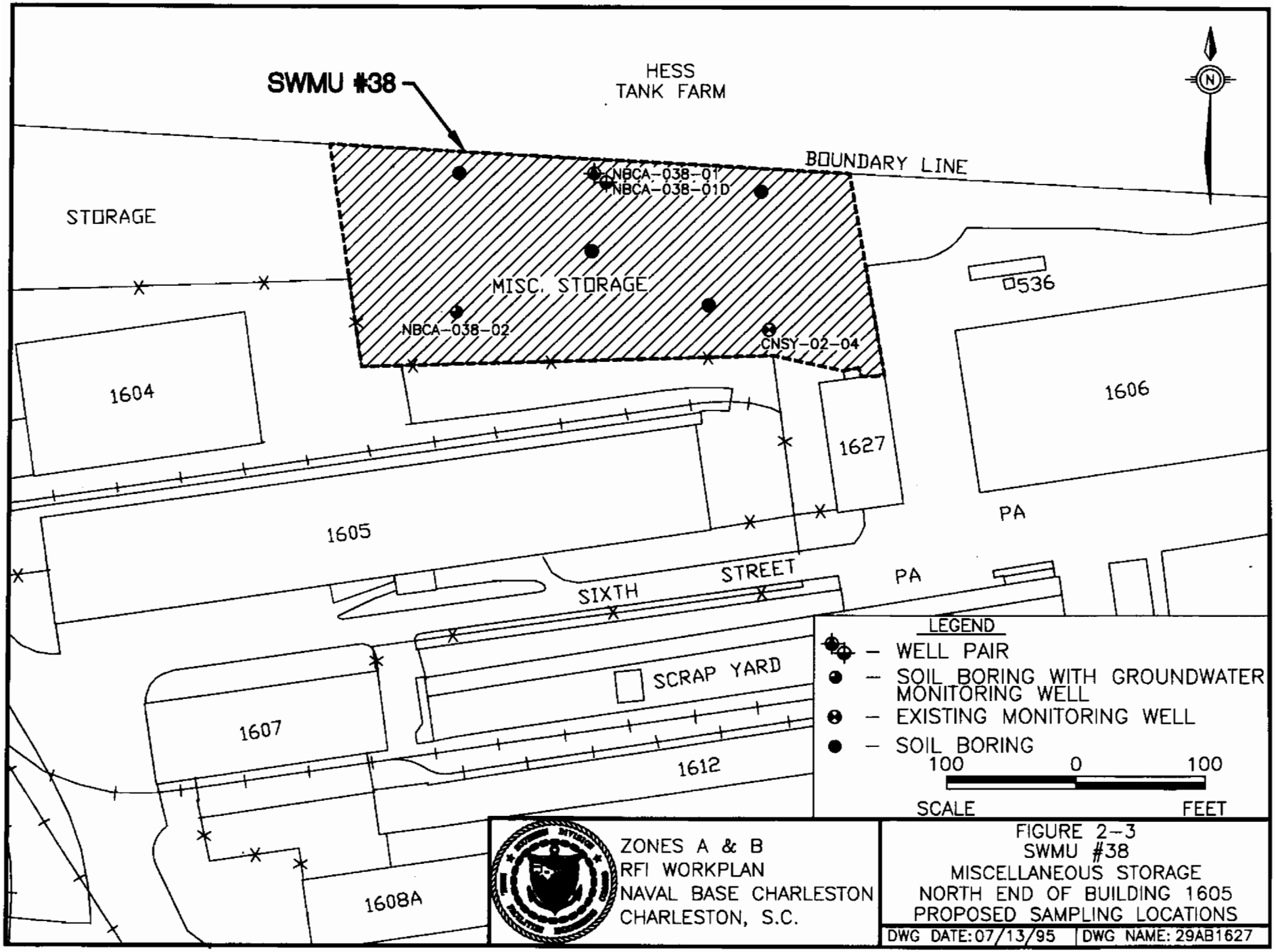
Selected soil samples will be tested for permeability, grain size, porosity, total organic carbon (TOC), and cation exchange capacity (CEC).

Notes:

Groundwater monitoring wells will be sampled quarterly for one year.

The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion may be necessary to meet the stated objectives.

All analyses will be performed per SW-846 except where other methods are specified. DQO Level III analyses will be performed as specified in the *Final Comprehensive RFI Work Plan*, with a minimum of 10 percent duplicates analyzed for all Appendix IX constituents at DQO Level IV. The sample quantities presented do not include QA/QC samples.


SWMU #38
HESS
TANK FARM
BOUNDARY LINE
NBCA-038-01
NBCA-038-01D
STORAGE
MISC. STORAGE
NBCA-038-02
CNSY-02-04
1536
1604
1606
1627
1605
PA
SIXTH
STREET
PA
SCRAP YARD
1607
1612
1608A
LEGEND
– WELL PAIR
– SOIL BORING WITH GROUNDWATER MONITORING WELL
– EXISTING MONITORING WELL
– SOIL BORING
100 0 100
SCALE FEET
ZONES A & B
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 2-3
SWMU #38
MISCELLANEOUS STORAGE
NORTH END OF BUILDING 1605
PROPOSED SAMPLING LOCATIONS
DWG DATE: 07/13/95
DWG NAME: 29AB1627

2.3 SWMU 39, Former POL Drum Storage Area, Building 1604

SWMU 39 is the site of a former storage area for petroleum, oil, and lubricant (POL) drums north of Building 1604. This asphalt-paved area is near the northern boundary of NAVBASE. The Hess Oil tank farm is adjacent to this boundary. Therefore, the RFI designated for this site will also assess potential petroleum releases from the offsite tanks. Table 2-5 describes this AOC.

Table 2-5
SWMU 39
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
SWMU 39 **Former POL Drum** **Storage area**	This site is a former storage area for POL drums. It is on an asphalt-paved area north of Building 1604, near the northern boundary of NAVBASE. The Hess Oil tank farm is close to this site.[a]	Petroleum, Oils, and Lubricants (POLs)	**Soil** Soil Gas **Groundwater** Air Surface water

Notes:

[a] Described in the *Final RCRA Facility Assessment, Volume I, June 6, 1995.*
[b] Pathways scheduled for sampling are bold.

2.3.1 Previous Investigations

This site has not been investigated previously.

2.3.2 Treatment Alternatives

Because there are no environmental media data, treatment alternatives for this site cannot be evaluated.

2.3.3 Data Gaps

Currently, no environmental media data have been collected at SWMU 39 to characterize the site or to support detailed evaluation of treatment alternatives, if necessary. To ensure data collection efforts are sufficient to meet the stated investigation objectives, the following data gaps have been identified and will be resolved:

- There are no data to establish whether COPCs are present for any of the potential migration pathways.

- No data exist to support a detailed evaluation of treatment alternatives, if necessary.

2.3.4 Potential Receptors

Potential receptors that may be exposed to site contaminants include current land users, such as NAVBASE personnel, and any future users this area may support following closure. Data will be generated during the investigation to determine the level of risk to the spectrum of current and potential future receptors, including any highly sensitive individuals within the population who may be exposed through invasive or noninvasive activities. Sampling will characterize the potential pathways bolded in Table 2-5.

The majority of the land near SWMU 39 is currently paved and used for both vehicle and pedestrian traffic. Potential receptors are workers involved with any invasive type of activity, such as utility maintenance, bringing them in direct contact with subsurface contaminants. Considering the shallow depth to groundwater, generally less than 4 feet bgs, site workers could also be subject to accidental ingestion or dermal exposure to contaminated groundwater.

2.3.5 Objective

The goal of the RFI is to use DQO Level III or IV data to determine whether COPCs are present and to determine if potential releases from the adjacent Hess Oil tank farm have impacted NAVBASE property. The RFI will also fill the identified data gaps by delineating the horizontal and vertical extent of any soil and/or groundwater contamination as well as the rate of contamination migration at the sites. Data collection efforts will also support the technical evaluation of identified remedial alternatives.

2.3.6 Screening Alternatives

No sampling has been conducted to determine COPCs; therefore, selecting a screening alternative would be premature. If the proposed collection of the high-quality samples is inadequate to define the areal extent of contamination (if present), the feasibility of employing screening methods will be re-evaluated. However, all soil boring samples will be screened for VOCs with a PID. If the presence of chlorinated compounds are suspected, a FID will be used instead. All screening results will be recorded in field notebooks and boring logs.

2.3.7 Sampling and Analysis Plan

To fulfill the RFI objectives, the following site-specific sampling and analysis requirements have been proposed. Table 2-6 summarizes the types of samples to be collected and the analytical parameters. Ten soil borings, five shallow monitoring wells, and one deep well are proposed.

The five shallow monitoring wells will be installed to determine if either site has impacted surrounding groundwater. Three wells will be installed surrounding SWMU 39 and two wells are proposed along the NAVBASE/Hess Oil boundary line. The three wells in the vicinity of SWMU 39 cover upgradient, middle, and downgradient locations. A deep well (well pair) is proposed for the middle location. The majority of these locations permit access for the drill rigs, as four of the locations are unpaved areas adjacent to fence lines. These proposed locations are also out of the primary flow of traffic, and they would not require flush-mounting or risk being damaged by vehicles.

Four of the ten proposed soil borings are located in the former storage area to detect the presence of contamination, if any, from SWMU 39. Three soil borings, placed along the NAVBASE property line, are proposed to detect the presence of potential contamination migrating from the Hess Oil tank farm. Three additional soil borings spaced on the gravel area

Samples from two depths are proposed for each of the 10 soil borings, surface (0 to 1 foot) and subsurface (3 to 5 feet). The proposed sampling locations are illustrated on Figure 2-4. All sampling will adhere to the NAVBASE *Final Comprehensive RFI Work Plan* (August 30, 1994).

Table 2-6
SWMU 39
Sampling Plan

Matrix	Quantity	Analysis
Soil (0-1' bgs)	10	VOCs and SVOCs with TICs, Metals, Pesticides, PCBs, and TPH.
Soil (3-5' bgs)	10	
Groundwater (Shallow well)	5	
(Deep well)	1	

Engineering Parameters:

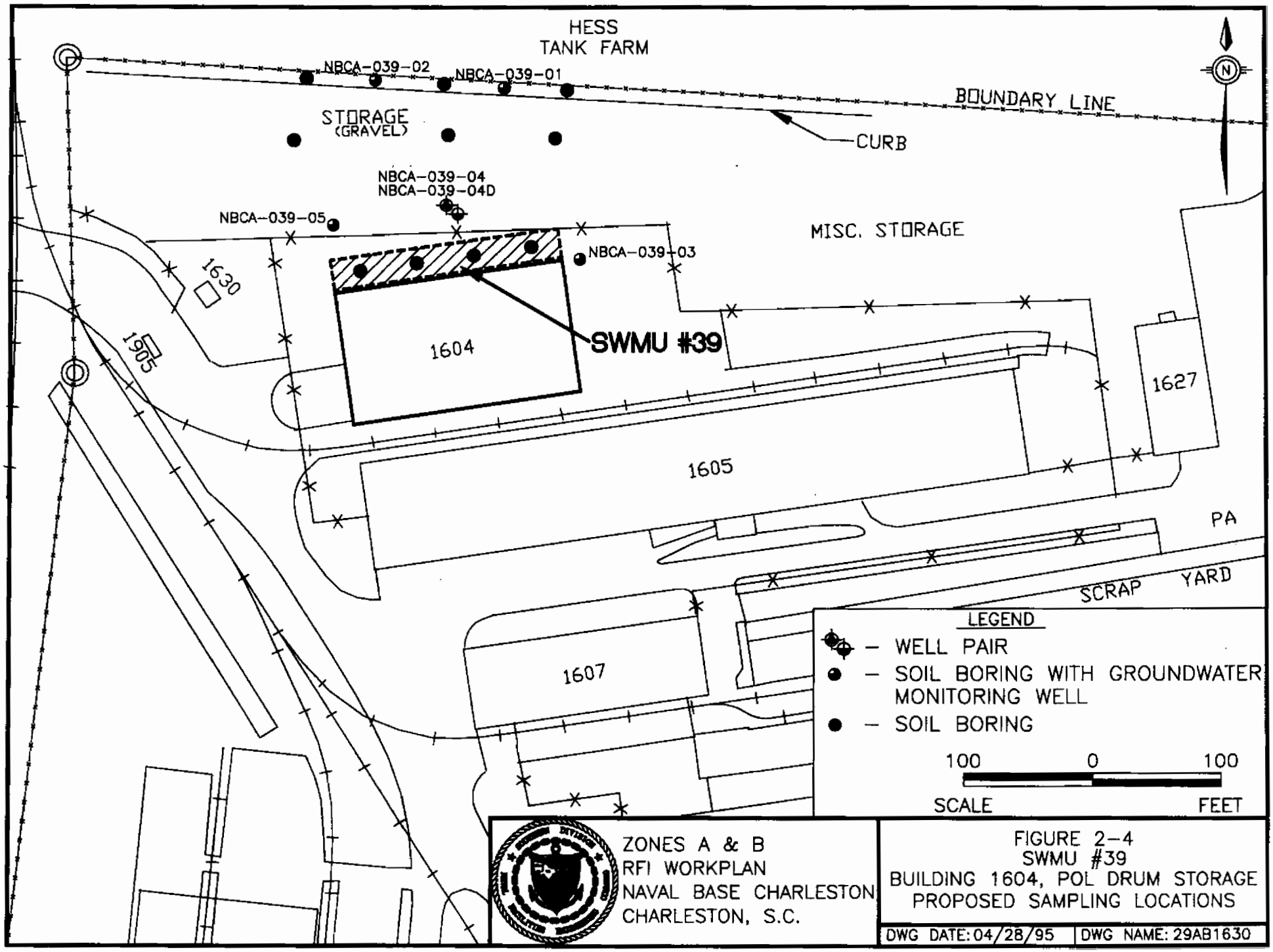
Selected soil samples will be tested for permeability, grain size, porosity, total organic carbon (TOC), and cation exchange capacity (CEC).

Notes:

Groundwater monitoring wells will be sampled quarterly for one year.

The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion may be necessary to meet the stated objectives.

All analyses will be performed per SW-846 except where other methods are specified. DQO Level III analyses will be performed as specified in the *Final Comprehensive RFI Work Plan*, with a minimum of 10 percent duplicates analyzed for all Appendix IX constituents at DQO Level IV. The sample quantities presented do not include QA/QC samples.


HESS
TANK FARM
NBCA-039-02
NBCA-039-01
BOUNDARY LINE
STORAGE
(GRAVEL)
CURB
NBCA-039-04
NBCA-039-04D
NBCA-039-05
MISC. STORAGE
NBCA-039-03
1630
1604
SWMU #39
1627
1605
1905
PA
SCRAP YARD
1607
LEGEND
– WELL PAIR
– SOIL BORING WITH GROUNDWATER MONITORING WELL
– SOIL BORING
100 0 100
SCALE FEET
ZONES A & B
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 2-4
SWMU #39
BUILDING 1604, POL DRUM STORAGE
PROPOSED SAMPLING LOCATIONS
DWG DATE: 04/28/95
DWG NAME: 29AB1630

2.4 SWMU 42, Former Asphalt Plant Tanks/Boiler Plant and AOC 505, Creosote Cross-Tie/Railroad Ballast Storage Area

SWMU 42, a CSI site, and AOC 505, an RFI site, include the location of a former asphalt plant and the area where new railroad cross-ties were stored prior to installation, and where removed railroad ballast was stored during the railroad upgrade projects completed in the late 1960s and early 1970s. The area also includes Building 1803, Golf Course Maintenance Building. The sites are bounded by the railroad storage yard surrounding Building 1614 to the north; Noisette Creek to the south, and the Southern Railroad spur to the west. The east side of the site roughly follows a rail spur leaving the railroad storage yard and cuts across the open area to Noisette Creek bridge on Avenue D North. Table 2-7 describes these sites.

Table 2-7
SWMU 42 and AOC 505
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
SWMU 42 Former Asphalt Plant and Tanks	SWMU 42 consists of a former asphalt plant site and its associated tanks. The unit operated from 1947 until 1962, and has since been demolished. Because the unit was taken out of service in the early 1960s, little information is available regarding dimensions, design features, operating practices, or waste disposal methods. The site currently contains a concrete rack used to support asphalt-related aboveground storage tanks. The unpaved surrounding area contains rock and asphalt debris.[a]	VOCs, heavy metals, phenolic compounds, polynuclear aromatic hydrocarbons (PAHs), and petroleum hydrocarbons.	**Soil** Air Soil Gas Surfacewater **Groundwater**
AOC 505 Creosote Cross-Tie/Ballast Storage Area and Golf Course Maintenance Building	AOC 505 consists of Building 1803, the former golf course maintenance shop, and a nearby area which was used to store creosote cross-ties and removed railroad ballast during the 1960s and 1970s. Pesticides used at the golf course were handled in Building 1803. The site is currently a graveled area containing a considerable quantity of asphalt rubble, traces of tar, and other similar debris. Because operations at this unit were discontinued in the 1970s, little information could be located concerning the unit's design features, actual dates of operation, or operating practices.[a]	VOCs, phenolic compounds, PAHs, chlorinated pesticides and herbicides, petroleum hydrocarbons, and heavy metals	**Soil** Air Soil Gas Surfacewater **Groundwater**

Notes:

[a] Described in the *Final RCRA Facility Assessment, Volume II, June 6, 1995.*
[b] Pathways scheduled for sampling are bold.

2.4.1 Previous Investigations

These sites have not been investigated previously.

2.4.2 Treatment Alternatives

As outlined in the overall sampling strategy presented in the *Final Comprehensive RFI Work Plan*, treatment alternatives are being identified for each of the sites likely to require some type of remedial action. Data will be collected to support evaluation of these alternatives. Table F-1 (Appendix F) lists treatment alternatives for groundwater; Table F-2 lists treatment alternatives for soil; and Table F-3 lists treatment alternatives for the presence of soil gas. Alternatives presented here are for preliminary evaluation only. If contaminants are present at concentrations requiring remediation, a CMS will be undertaken to identify the most feasible treatment alternatives.

2.4.3 Data Gaps

Currently, no environmental media data have been collected to characterize these sites or to support a detailed evaluation of treatment alternatives, if necessary. To ensure data collection efforts are sufficient to meet the stated investigative objectives, the following data gaps have been identified and will be resolved:

- The nature and extent of impact to environmental media (soil and groundwater) has not been defined.

- No data exist to support a detailed evaluation of treatment alternatives.

2.4.4 Potential Receptors

Potential receptors that may be exposed to site contaminants include biological receptors in Noisette Creek and current land users, such as NAVBASE personnel, and any future users this area may support following closure. Data will be generated during the investigation to

determine the level of risk to the spectrum of current and potential future receptors, including any highly sensitive individuals within the population, who may be exposed through invasive or noninvasive activities. Sampling will characterize the potential pathways highlighted in Table 2-7. The surface water and sediment pathways will be characterized in the Zone J RFI. The railroad ballast system throughout the Charleston Naval Base will be characterized in the Zone L RFI.

Land at SWMU 42 and AOC 505 is currently used as a contractor mobilization area, with the portion within the railroad storage area used for drum storage. The remainder of the area is not used. Potential receptors are workers involved with any invasive type of activity, such as utility maintenance, bringing them in direct contact with subsurface contaminants. Considering the shallow depth to groundwater, generally less than 4 feet bgs, site workers could also be subject to accidental ingestion or dermal exposure to contaminated groundwater.

The area's utility system and railroad lines may act as a conduit for moving any contaminants released in this vicinity, and thus could expose anyone working on these underground systems in the general area, as well as providing a contaminant migration route to Noisette Creek or the Cooper River. Noisette Creek, and eventually the Cooper River, could receive contaminated surface water runoff and groundwater discharges, resulting in exposure to biological receptors other than humans.

2.4.5 Objective

The objective of the proposed field investigation is to confirm whether contamination is present in environmental media. If present, the investigation will delineate the horizontal and vertical extent of any soil and/or groundwater contamination. While sediment, soil gas, surface water, and underground utility conduits are potential contaminant pathways, initial sampling of these matrices is not required to determine if contaminants are present. For SWMU 42, if soil and/or groundwater contamination is identified, then the site will be designated for a complete RFI to

delineate the nature and extent of contamination. For AOC 505, the nature and extent of any contamination found will be delineated during this effort. Data collection efforts will support technical evaluation of identified treatment alternatives.

2.4.6 Screening Alternatives

No sampling has been conducted to determine COPCs; therefore, selecting a screening alternative would be premature. If the proposed collection of high-quality samples is inadequate to define the areal extent of contamination (if present), the feasibility of employing screening methods will be reevaluated.

A PID will be used to qualitatively screen for VOCs in all soil boring samples. If the presence of chlorinated compounds are suspected, a FID will be used instead. Results will be recorded in the field notes and on boring logs.

2.4.7 Sampling and Analysis Plan

To fulfill the CSI objectives and RFI objectives, site-specific sampling and analysis requirements have been proposed for SWMU 42 and AOC 505, respectively. Table 2-8 summarizes the types of samples to be collected and the analytical parameters. For purposes of sample location, the boundaries of both SWMU 42 and AOC 505 have been outlined based upon a review of NAVBASE records.

Three soil borings and three shallow monitoring wells set strategically across the northern section of SWMU 42 and four soil borings placed near the railroad ballast in the southern portion of SWMU 42 area are proposed to determine if the asphalt plant adversely impacted the soil or groundwater in the area.

For AOC 505, ten soil borings are proposed across the area to determine the nature and extent of any soil contamination from storing of railroad cross-ties and removed ballast. Additionally, one shallow monitoring well will be installed in this area to determine the nature and extent of groundwater contamination, if any. Nine soil borings and one shallow monitoring well, used to support the AOC 505 investigation, are in the study area where SWMU 42 and AOC 505 overlap. Data from all borings and groundwater wells will be used to determine the impact by identified past facilities and operations throughout the study area. Additionally, data from samples proposed within the Zone L Work Plan that are in these areas will be combined with data from this investigation. Data from five shallow monitoring wells and seven soil borings from the Zone L Work Plan will be included in the report for this site.

Samples from two depths are proposed for each of the 17 soil borings, surface (0 to 1 foot) and subsurface (3 to 5 feet). Proposed sampling locations (including Zone L locations) are illustrated on Figure 2-5. All sampling will adhere to the NAVBASE *Final Comprehensive RFI Work Plan* (August 30, 1994).

Table 2-8
SWMU 42 and AOC 505
Sampling Plan

Matrix	Quantity	Analysis
Soil (0-1' bgs)	17	VOCs and SVOCs with TICs, Metals, Cyanide, Herbicides, Pesticides, and PCBs.
Soil (3-5' bgs)	17	
Groundwater (Shallow well)	4	

Engineering Parameters:

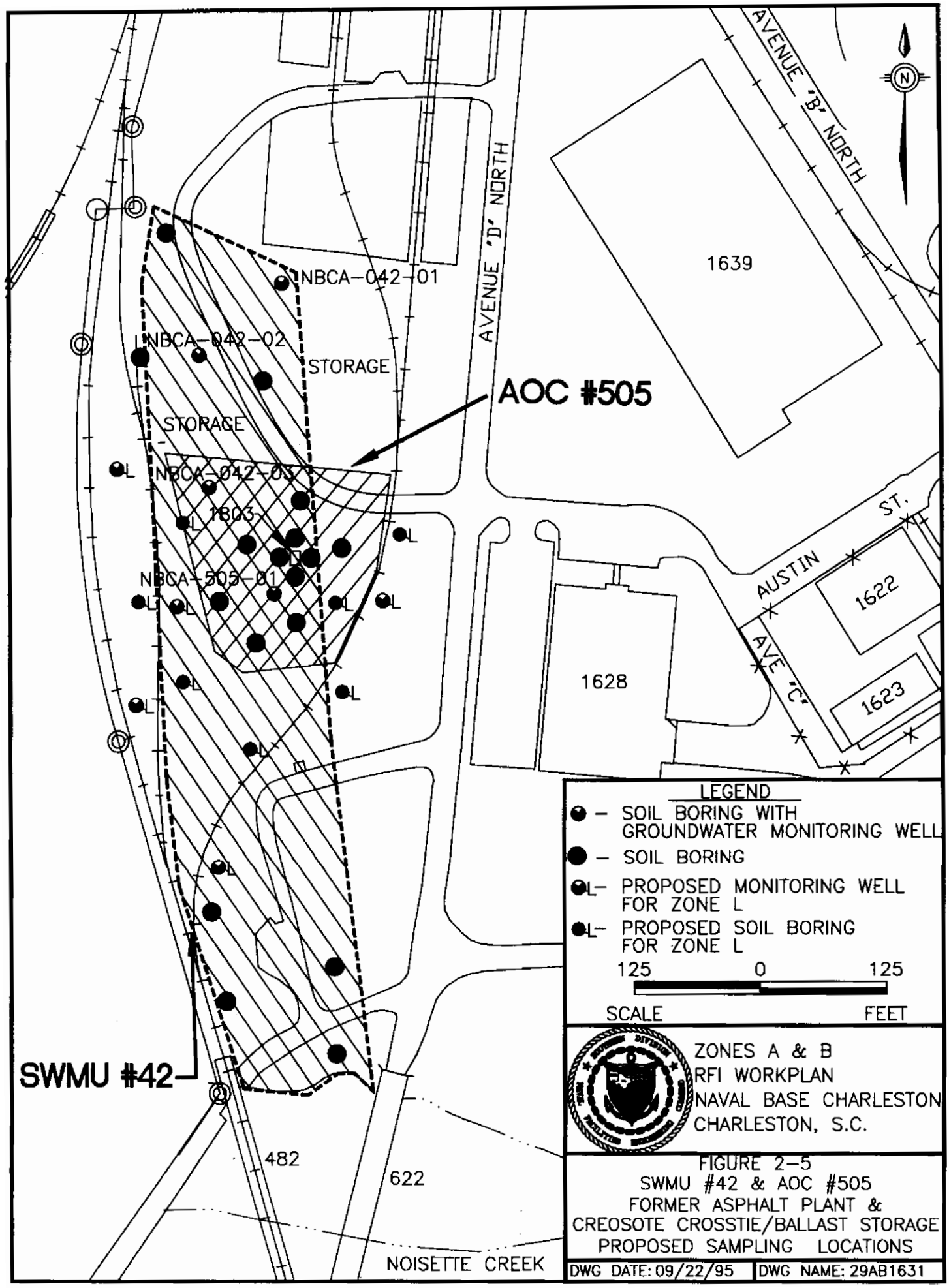
Selected soil samples will be tested for permeability, grain size, porosity, total organic carbon (TOC), and cation exchange capacity (CEC).

Notes:

Groundwater monitoring wells will be sampled quarterly for one year.

The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion may be necessary to meet the stated objectives.

All analyses will be performed per SW-846 except where other methods are specified. DQO Level III analyses will be performed as specified in the *Final Comprehensive RFI Work Plan*, with a minimum of 10 percent duplicates analyzed for all Appendix IX constituents at DQO Level IV. The sample quantities presented do not include QA/QC samples.


AVENUE 'B' NORTH
AVENUE 'D' NORTH
1639
NBCA-042-01
NBCA-042-02
STORAGE
STORAGE
AOC #505
NBCA-042-03
1803
NBCA-505-01
AUSTIN ST.
1622
AVE 'C'
1623
1628
SWMU #42
482
622
NOISETTE CREEK
LEGEND
– SOIL BORING WITH GROUNDWATER MONITORING WELL
– SOIL BORING
L– PROPOSED MONITORING WELL FOR ZONE L
L– PROPOSED SOIL BORING FOR ZONE L
125 0 125
SCALE FEET
ZONES A & B
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 2-5
SWMU #42 & AOC #505
FORMER ASPHALT PLANT &
CREOSOTE CROSSTIE/BALLAST STORAGE
PROPOSED SAMPLING LOCATIONS
DWG DATE: 09/22/95
DWG NAME: 29AB1631

2.5 SWMU 43, Publications and Printing Plant, Building 1628

SWMU 43 is Building 1628, the Publications and Printing Plant, which has been in operation since 1979. A darkroom and hazardous materials lockers are on the ground floor of the building, although no hazardous materials are currently stored in the facility. Prior to the installation of the lockers, hazardous materials were stored in two areas outside of the building. The CSI proposed for SWMU 43 will investigate these areas for potential releases to the surrounding soil. Table 2-9 describes this SWMU.

Table 2-9
SWMU 43
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
SWMU 43 Publications and Printing Plant, Building 1628	The primary materials of concern for this SWMU are photograph development chemicals, potentially containing silver. However, developing solutions contained numerous other compounds. Based on visual inspection, Building 1628 does not pose an environmental threat. However, the two storage areas east of the building require investigation.[a]	silver-containing developing solutions, lead, chromium, acetic acid, ferric chloride, and potassium hydroxide	**Soil** Soil Gas Surface water Groundwater Air

Notes:

[a] Described in the *Final RCRA Facility Assessment, Volume II, June 6, 1995.*
[b] Pathways scheduled for sampling are bold.

2.5.1 Previous Investigations

This site has not been investigated previously.

2.5.2 Treatment Alternatives

Because there are no environmental media data, treatment alternatives for this site cannot be evaluated.

2.6 AOC 506, Building 1629, Flammable Storage Shelter

AOC 506 is Building 1629, a structure used to store flammable material returned to Building 1603, the DRMO Material Turn-In Site. The CSI proposed for AOC 506 will investigate adjacent areas for potential releases. Table 2-11 describes this AOC.

Table 2-11
AOC 506
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
AOC 506 Flammable Storage Shelter, Building 1629	This site has been used since 1942 to store flammable material returned to Building 1603. It consists of a 21-foot-by-30-foot concrete pad enclosed with a chain-link fence and covered by a metal roof. Based on visual inspection, there is a second storage shelter to the south of Building 1629. No containment structures are associated with the unit, and a release could impact the unpaved adjacent areas.[a]	Solvents, paints, fuels, and other unknown flammable materials	**Soil** Soil Gas Surface water **Groundwater** Air

Notes:

[a] Described in the *Final RCRA Facility Assessment, Volume II, June 6, 1995.*
[b] Pathways scheduled for sampling are bold.

2.6.1 Previous Investigations

This site has not been investigated previously.

2.6.2 Treatment Alternatives

Because there are no environmental media data, treatment alternatives for this site cannot be evaluated.

2.6.3 Data Gaps

Currently no environmental media data have been collected at AOC 506 to characterize the site or to support a detailed evaluation of treatment alternatives, if necessary. To ensure data

collection efforts are sufficient to meet the stated investigation objectives, the following data gaps have been identified and will be resolved:

- There are no data to establish whether COPCs are present for any of the potential migration pathways.

- No data exist to support a detailed evaluation of treatment alternatives, if necessary.

2.6.4 Potential Receptors

Potential receptors that may be exposed to site contaminants include current land users, such as NAVBASE personnel, and any future users this area may support. Data will be generated during the investigation to determine the level of risk to the entire spectrum of current and potential future receptors, including any highly sensitive individuals, who might be exposed through invasive or noninvasive activities. Sampling will characterize the potential pathways highlighted in Table 2-11. Also, the Cooper River is approximately 200 feet from this unit and the potential exists for exposure to biological receptors other than humans. Characterizing potential surface water and sediment contamination in the Cooper River will be addressed in the Zone J RFI Work Plan.

The land near AOC 506 is open, and potential receptors would likely be workers involved with any invasive activity bringing them in direct contact with subsurface contaminants. Considering the shallow depth to groundwater, generally less than 4 feet bgs, site workers could also be subject to accidental ingestion or dermal exposure to contaminated groundwater.

2.6.5 Objective

The goal of the CSI is to classify the site as NFI or RFI by using DQO Level III or IV data to determine whether COPCs are present. If an RFI is required, the objective of field investigations shall be to fill the identified data gaps by delineating the horizontal and vertical

extent of any soil and/or groundwater contamination as well as the rate of contamination migration at the site. Data collection efforts will also support the technical evaluation of identified remedial options.

2.6.6 Screening Alternatives

No sampling has been conducted to determine COPCs; therefore, selecting a screening alternative would be premature. If the proposed collection of the high-quality samples is inadequate to define the areal extent of contamination (if present), the feasibility of employing screening methods will be reevaluated. However, all soil boring samples will be screened for VOCs with a PID. If the presence of chlorinated compounds are suspected, a FID will be used instead. All screening results will be recorded in field notebooks and boring logs.

2.6.7 Sampling and Analysis Plan

To fulfill the CSI objectives, the following site-specific sampling and analysis requirements have been proposed. Table 2-12 summarizes the types of samples to be collected and the analytical parameters. Four soil boring locations strategically placed around building 1629 and the drum storage shelter are proposed to detect the presence of any contamination due to a release from AOC 506. Additionally, one shallow monitoring well will be installed in a biased location to confirm whether a release to groundwater has occurred. If groundwater contamination is detected, additional monitoring wells will be installed.

Samples will be collected at two depths for each soil boring, surface (0 to 1 foot) and subsurface (3 to 5 feet). Each proposed sampling location is illustrated on Figure 2-7. All sampling will adhere to the NAVBASE *Final Comprehensive RFI Work Plan* (August 30, 1994).

Table 2-12
AOC 506
Sampling Plan

Matrix	Quantity	Analysis
Soil (0-1' bgs)	4	VOCs and SVOCs with TICs, and Metals
Soil (3-5' bgs)	4	
Groundwater		
(Shallow well)	1	

Engineering Parameters:

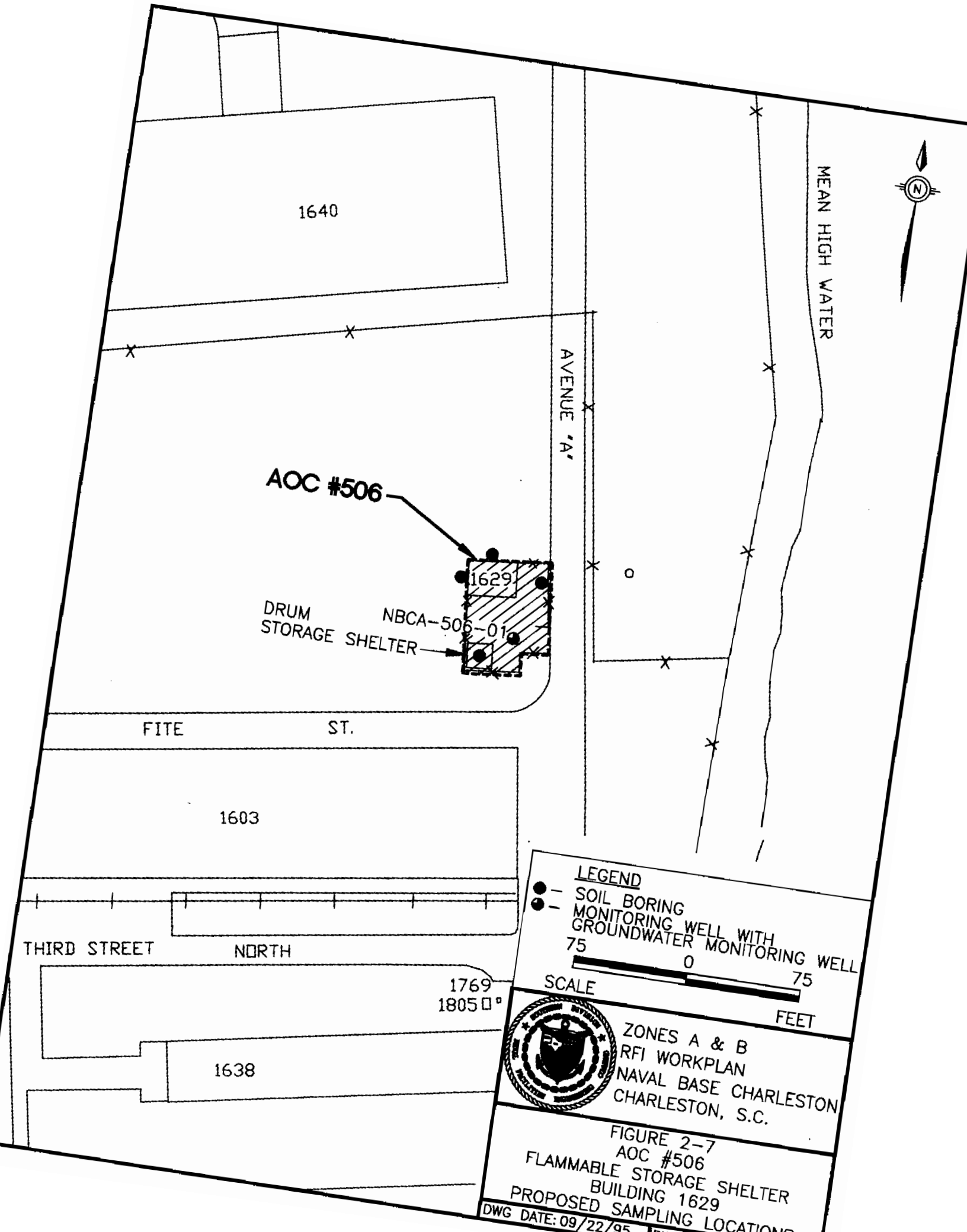
Selected soil samples will be tested for permeability, grain size, porosity, total organic carbon (TOC), and cation exchange capacity (CEC).

Notes:

Groundwater monitoring wells will be sampled quarterly for one year.

The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion may be necessary to meet the stated objectives.

All analyses will be performed per SW-846 except where other methods are specified. DQO Level III analyses will be performed as specified in the *Final Comprehensive RFI Work Plan*, with a minimum of 10 percent duplicates analyzed for all Appendix IX constituents at DQO Level IV. The sample quantities presented do not include QA/QC samples.


1640
AVENUE 'A'
MEAN HIGH WATER
N
AOC #506
1629
DRUM STORAGE SHELTER
NBCA-506-01
FITE ST.
1603
THIRD STREET NORTH
1769
1805
1638
LEGEND
SOIL BORING
MONITORING WELL WITH GROUNDWATER MONITORING WELL
75 0 75
SCALE FEET
ZONES A & B
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 2-7
AOC #506
FLAMMABLE STORAGE SHELTER
BUILDING 1629
PROPOSED SAMPLING LOCATIONS
DWG DATE: 09/22/95

2.7 AOC 507, Oil Storehouse, Former Building 1010

AOC 507 is former Building 1010, an oil storehouse on part of the NAVBASE golf course. The CSI proposed for AOC 507 will investigate adjacent soil for potential releases. Table 2-13 describes this AOC.

Table 2-13
AOC 507
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
AOC 507, Oil Storehouse, Former Building 1010	This site was demolished more than 80 years ago, so little information was available regarding the building's specifications or use during the period of operation. New research indicates that the structure was at the end of a cul-de-sac, southwest of the fairway for hole No. 9. Due to the period of operation, it is unlikely that containment and spill cleanup procedures were in place. A release could impact the surrounding property, as it is unpaved.[a]	POLs	**Soil** Soil Gas Surfacewater Groundwater Air

Notes:

[a] Described in the *Final RCRA Facility Assessment, Volume II, June 6, 1995.*
[b] Pathways scheduled for sampling are bold.

2.7.1 Previous Investigations

This site has not been investigated previously.

2.7.2 Treatment Alternatives

Because there are no environmental media data, treatment alternatives for this site cannot be evaluated.

2.7.3 Data Gaps

Currently no environmental media data have been collected at AOC 507 to characterize the site or to support a detailed evaluation of treatment alternatives, if necessary. To ensure data

collection efforts are sufficient to meet the stated investigation objectives, the following data gaps have been identified and will be resolved:

- There are no data to establish whether COPCs are present for any of the potential migration pathways.

- No data exist to support a detailed evaluation of treatment alternatives, if necessary.

2.7.4 Potential Receptors

Potential receptors that may be exposed to site contaminants include current land users, such as NAVBASE personnel, and any future users this area may support. Data will be generated during the investigation to determine the level of risk to the entire spectrum of current and potential future receptors, including any highly sensitive individuals, who might be exposed through invasive or noninvasive activities. Confirmatory sampling will characterize the potential pathways highlighted in Table 2-13. Also, the Cooper River is approximately 300 feet from this unit and the potential exists for exposure to biological receptors other than humans. Characterizing potential surface water and sediment contamination in the Cooper River will be addressed in the Zone J RFI.

The land near AOC 507 is the NAVBASE golf course, which is no longer in official operation. However, personnel still use the property for leisure activities, including golf. Therefore, an exposure potential exists for both recreational users of the area and workers involved with any invasive activity bringing them in direct contact with subsurface contaminants. Considering the shallow depth to groundwater, generally less than 4 feet bgs, site workers could also be subject to accidental ingestion or dermal exposure to contaminated groundwater.

2.7.5 Objective

The goal of the CSI is to classify the site as NFI or RFI by using DQO Level III or IV data to determine whether COPCs are present. If an RFI is required, the objective of field investigations shall be to fill the identified data gaps by delineating the horizontal and vertical extent of any soil contamination as well as the rate of contamination migration at the site. Data collection efforts will also support the technical evaluation of identified remedial options.

2.7.6 Screening Alternatives

No sampling has been conducted to determine COPCs; therefore, selecting a screening alternative would be premature. If the proposed collection of the high-quality samples is inadequate to define the areal extent of contamination (if present), the feasibility of employing screening methods will be reevaluated. However, all soil boring samples will be screened for VOCs with a PID. If the presence of chlorinated compounds are suspected, a FID will be used instead. All screening results will be recorded in field notebooks and boring logs.

2.7.7 Sampling and Analysis Plan

To fulfill the CSI objectives, the following site-specific sampling and analysis requirements have been proposed. Table 2-14 summarizes the types of samples to be collected and the analytical parameters. For purposes of sample location, the boundaries of AOC 507 have been outlined based upon a review of NAVBASE records. Due to the age of the records for this site, the location is a conservative estimate of the former structure's location.

Five soil boring locations are proposed to detect the presence of any contamination due to a release from AOC 507. Samples will be collected at two depths for each soil boring, surface (0 to 1 foot) and subsurface (3 to 5 feet). Each proposed sampling location is illustrated on Figure 2-8. All sampling will adhere to the NAVBASE *Final Comprehensive RFI Work Plan* (August 30, 1994).

Table 2-14
AOC 507
Sampling Plan

Matrix	Quantity	Analysis
Soil (0-1' bgs)	5	VOCs and SVOCs with TICs, and Metals
Soil (3-5' bgs)	5	

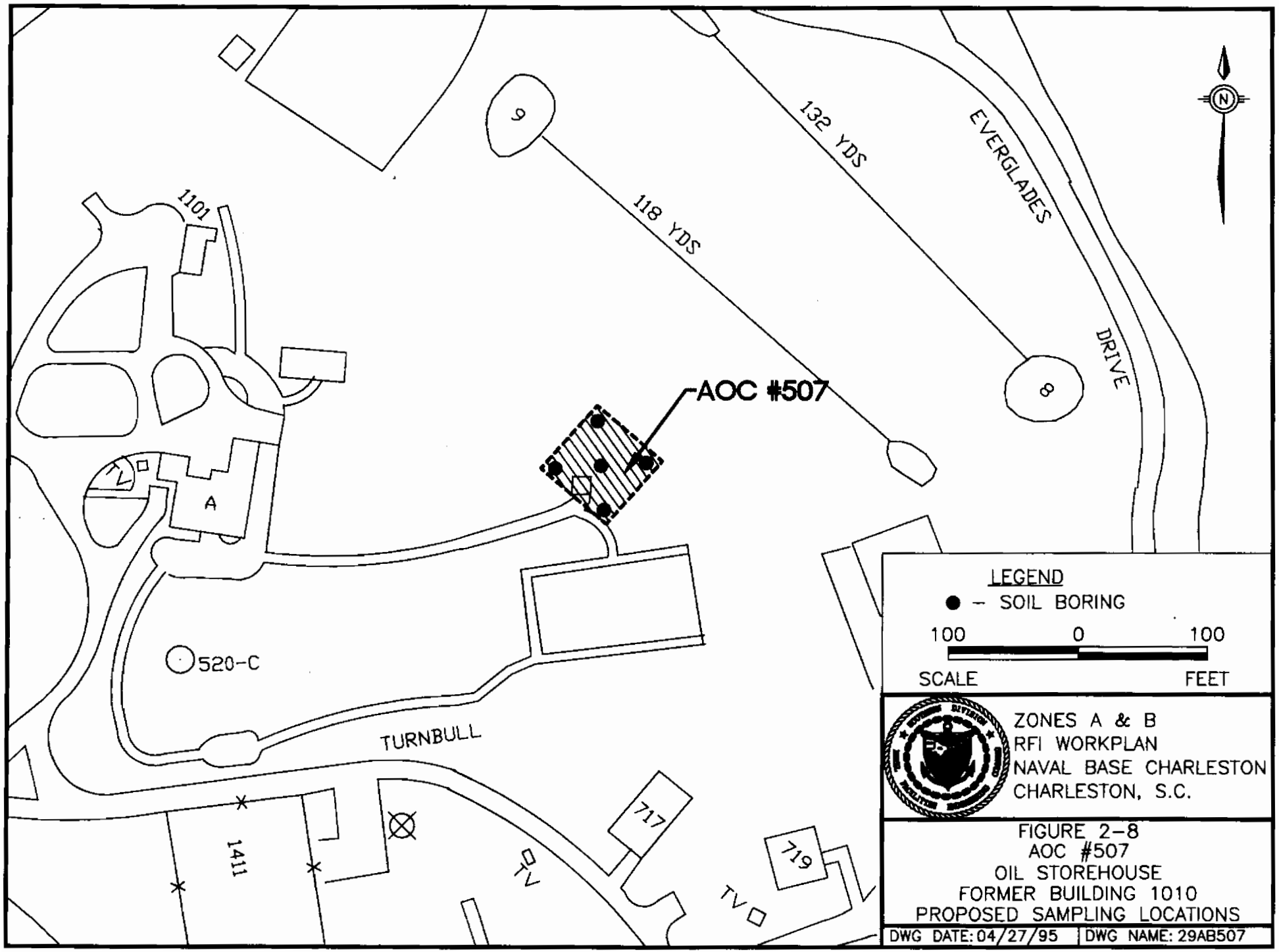
Engineering Parameters:

Selected soil samples will be tested for permeability, grain size, porosity, total organic carbon (TOC), and cation exchange capacity (CEC).

Notes:

The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion may be necessary to meet the stated objectives.

All analyses will be performed per SW-846 except where other methods are specified. DQO Level III analyses will be performed as specified in the *Final Comprehensive RFI Work Plan*, with a minimum of 10 percent duplicates analyzed for all Appendix IX constituents at DQO Level IV. The sample quantities presented do not include QA/QC samples.


9
132 YDS
EVERGLADES
DRIVE
118 YDS
8
1101
AOC #507
A
520-C
TURNBULL
1411
RV
717
719
TV
LEGEND
● – SOIL BORING
100 0 100
SCALE FEET
ZONES A & B
RFI WORKPLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.
FIGURE 2-8
AOC #507
OIL STOREHOUSE
FORMER BUILDING 1010
PROPOSED SAMPLING LOCATIONS
DWG DATE: 04/27/95
DWG NAME: 29AB507

3.0 SYSTEMATIC (GRID-BASED) SAMPLING PLAN

As noted in the RFA, much of NAVBASE is built upon a series of dredge spoil deposits, whose composition has been impacted by industrial activities to an unknown extent. It is anticipated that this heterogeneous structure will have a significant impact upon risk-management decisions, and, therefore, a more intensive approach for characterizing background conditions will be required than is typical of RFI investigations.

A systematic square grid scheme has been chosen to more fully characterize the nature of the NAVBASE soil and groundwater contamination. However, as discussed in the *Final Comprehensive RFI Work Plan*, Volume III, an algorithm has been designed to systematically exclude redundant sampling points, yet to focus limited resources near biased field investigations. The 30 grid-based sampling points for Zones A and B have been selected with a modified algorithm similar to the approach proposed in the Zone C RFI Work Plan due to the relatively small portion of only Zone B having been filled with dredge material. The modification which will result in a slightly lower grid-based sample density is as follows. A 200-foot grid spacing will be used oriented north to south, with a random start. Each grid node will be evaluated as a possible soil sample or groundwater well location. To determine soil sample locations, nodes that are within 150 feet of a biased soil sample location will not be used. Nodes that are between 150 and 300 feet from a biased soil sample location will not be used. Nodes that are 301 to 900 feet from a biased sampling point will be used if they are more than 400 feet away from any other biased or grid-based sampling point. Nodes that are greater than 900 feet away from any biased sampling point will be used if they are more than 800 feet away from any other sampling point. Groundwater monitoring well locations will be selected in the same manner as described in the comprehensive work plan.

In order to receive unbiased grid sampling results, points which fall into a biased AOC and/or SWMU site sampling scheme will not be sampled. The grid-based sampling points are intended to supplement the biased locations while delineating the site boundaries and provide a basis for

comparing site-specific soil and groundwater quality. Initially, none of the grid-based points will be designated as a background sampling location. Table 3-1 and Figure 3-1 present the proposed sampling descriptions and locations.

The usefulness of grid-based wells as background wells may be limited, due to the limited number of wells and the direction of groundwater flow. The wells will most often be used as reference wells to help delineate the extent of contaminant migration or to detect any point sources that have not been documented in the RFA.

Table 3-1
Grid-Based Sampling Plan

Matrix	Quantity	Analysis
Soil (surface)	22	Metals, VOCs with TICs, SVOCs with TICs, pesticides, PCBs, and cyanide
Soil (depth)	22	
Groundwater (Shallow)	7	Chlorides, TDS, and sulfates (groundwater only).
(Deep)	7	

Engineering Parameters:

Engineering parameters will be dictated by the field data collected.

Slug tests will be performed on 25 percent of the shallow/deep well pairs. While installing the deep wells, Shelby tubes will be collected at distinct changes in lithology. Samples will be tested for permeability, grain size, porosity, TOC, and CEC. Analysis for any of the remaining design parameters in Appendix F will be performed at selected locations when a better understanding of the contaminant distribution is developed.

Notes:

Groundwater monitoring wells will be sampled quarterly for one year.

The quantities presented are estimated numbers of samples believed to be needed to fulfill the objectives of the investigation. Expansion may be necessary to meet the stated objectives.

All analysis will be performed per SW-846 except where other methods are specified. DQO Level III analyses will be performed as specified in sampling plan, with a minimum of 10 percent duplicates analyzed for all Appendix IX constituents at DQO Level IV. The sample quantities presented do not include QA/QC samples.

4.0 HEALTH AND SAFETY PLAN

E/A&H is conducting an environmental monitoring program at various specified sites within NAVBASE. The purpose of the monitoring program is to assess the nature and extent of contamination at these sites and to determine if additional action is required to maintain compliance with environmental regulations.

The USEPA has divided the NAVBASE sites into SWMUs and AOCs. These SWMUs and AOCs have been grouped into zones for investigative purposes. This Zone-Specific Health and Safety Plan (ZHASP) has been developed for SWMUs and AOCs in Zones A and B.

This ZHASP was written to complement the E/A&H NAVBASE *Final Comprehensive Health and Safety Plan* (CHASP) by providing site-specific details which are absent in the CHASP. Site-specific details presented in this ZHASP include: potential site contaminants, proposed site activities, action levels and initial level of personal protective equipment (PPE). Copies of both this plan and the CHASP should be onsite during all field operations.

This Work Plan and ZHASP use both the term COPC and contaminant of concern (COCs). Not all COPCs are necessarily of interest from a human health perspective. COPCs refer to compounds of analytical interest. The analytical interest may be because of public health, regulatory, ecological, or other concerns. The term COC is used to identify (potential) site contaminants that may be present in sufficient concentrations to cause concern about potential occupational exposures to onsite personnel.

4.1 Applicability

The provisions of this plan are mandatory for E/A&H personnel. E/A&H personnel shall read this plan and sign the plan acceptance form (Appendix H) before starting site activities. In addition, personnel will operate in accordance with the most current requirements of Title 29 Code of Federal Regulations (CFR) Part 1910.120, Standards for Hazardous Waste

Operations and Emergency Responders (HAZWOPER). These regulations include the following provisions for employees involved in cleanup operations covered by RCRA: training, 1910.120(e); medical surveillance, 1910.120(f); and PPE, 1910.120(g).

All non-E/A&H personnel present in E/A&H work areas shall either adopt and abide by this ZHASP and the corresponding CHASP or shall have their own safety plans which, at minimum, meet the requirements of the E/A&H CHASP and ZHASP.

This ZHASP applies to standard field procedures and tasks such as drilling; installing and developing monitoring wells; surveying; and collecting soil, groundwater, surface water, and sediment samples. Non-routine procedures and tasks involving non-routine risks are not covered by this plan, examples of procedures that are not covered in this plan are:

- Trenching
- Confined space entry
- Locating and/or recovering unexploded ordnance
- Sampling, handling, or removing unidentified drums

Should it be necessary to conduct these or other "high-risk" tasks, specific health and safety procedures must be developed, approved, and implemented before proceeding.

4.2 Zone Characterization

Sites included in this ZHASP consist of SWMUs and AOCs as identified in the RFI plan for NAVBASE prepared by E/A&H. Table A (found in Appendix A) is a reference indicating the location of each SWMU and AOC within Zones A and B and the associated sampling locations.

Physical hazards that are inherent in environmental investigations, or present throughout the zone are discussed in Section 4.11. Site-specific health and safety information for each site in Zones A and B is located in Sections 4.3 through 4.10. Discussed in these subsections are site descriptions, planned site activities, chemical hazards, and PPE requirements. Also any operational/physical hazards that are specific to a site will be discussed in its subsection.

Under the heading "Chemical Hazard," chemical hazards are discussed in terms of COPCs. COPCs are selected to represent the range of acute and chronic health (toxicological) hazards that are, or foreseeably may be, present onsite. That is, not every chemical known or suspected of being present is listed as a COPC. Rather, one or two of the most toxic or most prevalent contaminants within a class of chemicals is listed. It is in this light that cadmium and chromium have been listed in the health and safety plan as COPCs. To illustrate this principle, listed below are classes of chemicals or chemical categories in one column; and examples of chemicals that may be COPCs are listed in the second column.

Class of Chemical/Product	**Contaminant of Potential Concern**
Chlorinated solvents/ Degreasers	perchloroethylene, chloroform, methylene chloride, trichloroethylene, and 1,1,1-trichloroethane
Non-chlorinated solvents	benzene, toluene, xylene, ethylbenzene, 2-butanone (MEK), and hexane
Metals/heavy metals	lead, cadmium, chromium (especially hexavalent chromium), mercury, silver, and copper
Fuels — gasoline, fuel, oils, diesel, lubricants	benzene, toluene, tetraethyl lead, kerosene, xylene, hexane
Paints	see Solvents and Metals above, plus tributyl tin
Pesticides — chlorinated	DDT, DDE, chlordane, dieldrin and endrin

Material Safety Data Sheets (MSDSs) for COPCs may be reviewed at the EnSafe/A&H Charleston Field Trailer.

4.2.1 Work Zones

Section 2.1 of the CHASP describes the function and interrelatedness of the three work zones which, in combination, comprise the work area. The three work zones are:

- Exclusion Zone (EZ)
- Contaminant Reduction Zone (CRZ)
- Support Zone (SZ)

These work zones will be established and used during field work covered under this ZHASP.

4.2.2 Work Area Access

Authorized personnel will be allowed access to work areas as long as they follow the requirements of this ZHASP and the CHASP. See also Work Area Access, Section 2.2 of the CHASP.

Authorized Personnel — To enter an E/A&H- controlled work area, all E/A&H personnel must have a current HAZWOPER training certificate on file onsite. Individuals whose certification is not on file, or those who have a more recent certificate (have attended a refresher course), will provide the onsite Supervisor with a copy of their certificate before being allowed to enter a work area.

Subcontractors, DOD oversight personnel, and other site visitors shall demonstrate compliance with HAZWOPER training requirements before entering a work area.

4.3 SWMU 1, DRMO Storage, and SWMU 2, Lead Contamination Area

SWMU 1 was used by the Defense Reutilization and Marketing Office (DRMO) to store property turned in from local armed forces activities. The property includes some products which could not be reutilized by other commands and were consequently classified as waste. Those which were considered hazardous waste were stored until the early 1990s in a covered storage shed formerly known as Building 1617. SWMU 1 has received certification of health-based risk clean closure for soils.

SWMU 2 consists of salvage bin No. 3 and the adjacent paved ground surface. The area was used to store recovered lead from lead-acid submarine batteries from the mid-1960s until 1984. Electrodes and associated internal metallic components were removed from the battery jars in the battery electrolyte treatment area, SWMU 5 in Zone E. Recovered materials were then placed on a railcar and transferred to the DRMO area for storage and eventual sale to a salvage contractor. Extensive sampling has been conducted at SWMU 2, and the site has been designated for an RFI because of the lead concentrations detected in surrounding media.

Table 4-1 describes both sites.

Table 4-1
SWMU 1 and SWMU 2
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
SWMU 1 DRMO Storage Area	This site is the location of a former DRMO Storage Shed, which included the storage of both nonhazardous and hazardous waste. The storage shed was a wood framed and roofed structure that was destroyed by Hurricane Hugo. The floor, which remains in place, consists of asphalt paved, and unpaved areas. Hazardous wastes were stored in containers and segregated according to type. No spills at the site were documented. SWMU 1 has been designated for an RFI.[a]	VOCs, Hydrazine, Metals, and Hazardous waste characteristics	**Soil** Soil Gas Sediment **Groundwater** Surface Water
SWMU 2 Lead Contamination Area	This site consists of salvage bin No. 3 and the surrounding area, which is paved. Lead dust from the recovery operations was released to the salvage bin by handling. Routine activities (vehicular traffic) in the DRMO yard area and natural processes (wind and storm water flow) have caused an area of lead contamination estimated to cover approximately 6 acres.[a]	Lead-acid batteries	**Soil** Sediment **Groundwater** Surface Water

Notes:

[a] Described in the *RCRA Facility Assessment, August 1987.*
[b] Pathways scheduled for sampling are bold.

Site Activities

Site activities will include soil borings, soil sampling, sediment sampling, and groundwater monitoring well development, purging, and sampling. Field work for this site is described in Section 2.1.7 of this work plan.

Chemical Hazards and PPE Requirements

Previous sampling activities at SWMU 1 indicate low concentrations (ranging as high as 75.8 ppb) of diethyl ether. With the exception of lead throughout the sample area, metals were found only in very low concentrations.

Previous E/A&H investigations at SWMU 2 indicated that the area was used to store recovered lead from lead-acid submarine batteries from the mid-1960s until 1984. The major constituents of concern are lead and sulfuric acid. Table 4-2 lists exposure guidelines for COPCs. MSDSs for suspected site COPCs can be accessed at the EnSafe/A&H Charleston Field Trailer. If additional constituents of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the ZHASP.

The initial PPE level for invasive field activities performed at both SWMU 1 and SWMU 2 will be modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required level of PPE shall be upgraded to Level C. Airborne concentrations of lead will be evaluated by industrial hygiene monitoring utilizing the OSHA 125G method.

Table 4-2
SWMU 1 and SWMU 2
Exposure Guidelines for Expected Site Chemical Hazards

COPC	Odor[a] Threshold	OSHA PEL[b]	ACGIH TLV[c]	NIOSH REL[d]	Ionization Potential (eV)	Flammable Range (% by Volume)
Diethyl ether	NA	400 ppm	400 ppm	NA	9.53	1.9
Lead	NA	0.05 mg/m^3	0.05 mg/m^3	0.1 mg/m^3	NA	NA
Sulfuric Acid	NA	1 mg/m^3	1 mg/m^3 3 mg/m^3 STEL	1 mg/m^3	NA	NA

Notes:

[a] = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.

[b] = Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.

[c] = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, *1993-1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.

[d] = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*

NA = Substance information not available, or substance unlisted.

4.4 SWMU 38, Miscellaneous Storage, North of Building 1605

SWMU 38 is the site of a former storage yard associated with Buildings 1605 and 1604 for approximately 50 years. The gravel storage area, bordered by a chain-link fence, originally belonged to the supply department and later became part of the DRMO. The DRMO used the site to store empty drums. Little is known about the materials previously stored onsite, which is near the northern boundary of NAVBASE. The Hess Oil, Inc. tank farm is adjacent to this boundary. Table 4-3 describes the site.

Table 4-3
SWMU 38
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
SWMU 38 Miscellaneous Storage, North of Bldg. 1605	This site is a former storage area for unknown materials and empty drums. It is located on an gravel area north of Building 1605, near the northern boundary of NAVBASE. The Hess Oil tank farm is close to this site.[a]	VOCs SVOCs Metals PCBs	**Soil** Soil Gas **Groundwater** Air Surface water

Notes:

[a] Described in the *Final RCRA Facility Assessment, June 6, 1995.*
[b] Pathways scheduled for sampling are bold.

Site Activities

Initial site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities include well development, purging, and sampling. Fieldwork for this site is described in Section 2.2.7 of this work plan.

Chemical Hazards and PPE Requirements

The COPCs at this site are petroleum products, heavy metals, solvents, polychlorinated biphenyls and battery acids. Table 4-4 lists exposure guidelines for these compounds. MSDSs for suspected site COPCs can be accessed at the EnSafe/A&H Charleston Field Trailer. If additional COPCs are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the ZHASP.

The initial PPE level for invasive field activities performed at SWMU 38 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required level of PPE shall be upgraded to Level C.

Table 4-4
SWMU 38
Exposure Guidelines for Expected Site Chemical Hazards

COPC	Odor[a] Threshold	OSHA PEL[b]	ACGIH TLV[c]	NIOSH REL[d]	Ionization Potential (eV)	Flammable Range (% by Volume)
Benzene	4.68 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	9.25	1.3 to 7.1
Cadmium	NA	0.6 mg/m^3 Ceiling	0.05 mg/m^3	Potential Occupational Carcinogen	NA	NA
Chromium	NA	1 mg/m^3	0.5 mg/m^3	NA	NA	NA
Ethyl-benzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	8.8	1.0 to 6.7
Kerosene	1 ppm	NA	NA	100 mg/m^3	6.8	0.7 to 5.0
Lead	NA	0.05 mg/m^3	0.05 mg/m^3	0.1 mg/m^3	NA	NA
Polychlorinated Biphenyls (PCBs)	NA	0.5 mg/m^3 Skin	0.5 mg/m^3 1 mg/m^3 STEL Skin	Not Listed	NA	NA
Sulfuric Acid	NA	1 mg/m^3	1 mg/m^3	1 mg/m^3	NA	NA
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 STEL	8.8	1.3 to 7.1
Xylene	1 ppm	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	8.6	1.0 to 7.0

Notes:

[a] = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.

[b] = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in 29 CFR 1910.1000.

[c] = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, *1993 - 1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.

[d] = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*

NA = Substance information not available, or substance unlisted.

4.5 SWMU 39, Former POL Drum Storage Area, Building 1604

SWMU 39, the site of a former storage area for petroleum, oil, and lubricant (POL) drums, is adjacent and north of Building 1604. This asphalt-paved area is near the northern boundary of NAVBASE. The Hess Oil tank farm is adjacent to this boundary. Table 4-5 describes the site.

Table 4-5
SWMU 39
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
SWMU 39 Former POL Drum Storage Area	This site is a former storage area for POL drums. It is on an asphalt-paved area north of Building 1604, near the northern boundary of NAVBASE. The Hess Oil, Inc. tank farm is in close proximity to this site.[a]	petroleum, oils, and lubricants (POLs)	**Soil** Soil Gas **Groundwater** Air Surface water

Notes:

[a] Described in the *Final RCRA Facility Assessment, June 6, 1995.*
[b] Pathways scheduled for sampling are bold.

Site Activities

Initial site activities will include soil borings, soil sampling, and installing of monitoring wells. Subsequent activities include well development, purging, and sampling. Fieldwork for this site is described in Section 2.3.7 of this work plan.

Chemical Hazards and PPE Requirements

The COC at this site are petroleum products. Table 4-6 lists exposure guidelines for these compounds. MSDSs for suspected site COPCs can be accessed at the EnSafe/A&H Charleston Field Trailer. If additional COPCs are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the ZHASP.

The initial PPE level for invasive field activities performed at SWMU 39 is modified Level D. The Action Level (AL) for this site is a continuous photoionization detector (PID) reading of 5 ppm or greater in the breathing zone. If this occurs, the required PPE level shall be upgraded to Level C.

Table 4-6
SWMU 39
Exposure Guidelines for Expected Site Chemical Hazards

COPC	Odor[a] Threshold	OSHA PEL[b]	ACGIH TLV[c]	NIOSH REL[d]	Ionization Potential (eV)	Flammable Range (% by Volume)
Benzene	4.68 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	9.25	1.3 to 7.1
Ethyl-benzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	8.8	1.0 to 6.7
Kerosene	1 ppm	NA	NA	100 mg/m^3	8.8	0.7 to 5.0
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 STEL	8.8	1.3 to 7.1
Xylene	1 ppm	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	8.6	1.0 to 7.0

Notes:

[a] = Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
[b] = Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in 29 CFR 1910.1000.
[c] = Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, *1993 - 1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
[d] = Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
NA = Substance information not available, or substance unlisted.
ppm = parts per million

4.6 SWMU 42, Former Asphalt Plant/Tanks Boiler Plant and AOC 505, Creosote Cross-Tie/Railroad Ballast Storage Area

SWMU 42, a CSI site, and AOC 505, an RFI site, include the location of a former asphalt plant and the area where new railroad cross-ties were stored prior to installation, and where removed railroad ballast was stored during the railroad upgrade projects completed in the late 1960s and early 1970s. The area also includes Building 1803, Golf Course Maintenance Building. The sites are bounded by the railroad storage yard surrounding Building 1614 to the north; Noisette Creek to the south, and the Southern Railroad spur to the west. The east side of the site roughly follows a rail spur leaving the railroad storage yard and cuts across the open area to Noisette Creek bridge on Avenue D North. These sites are described in Table 4-7.

Table 4-7
SWMU 42 and AOC 505
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
SWMU 42 Former Asphalt Plant and Tanks	SWMU 42 consists of a former asphalt plant site and its associated tanks. The unit operated from 1947 until 1962, and has since been demolished. Because the unit was taken out of service in the early 1960s, little information is available regarding dimensions, design features, operating practices, or waste disposal methods. The site currently contains a concrete rack used to support asphalt-related aboveground storage tanks. The unpaved surrounding area contains rock and asphalt debris.[a]	VOCs, heavy metals, phenolic compounds, polynuclear aromatic hydrocarbons (PAHs), and petroleum hydrocarbons.	**Soil** Air Soil Gas Surface water **Groundwater**
AOC 505 Creosote Cross-Tie/Ballast Storage Area and Golf Course Maintenance Building	AOC 505 consists of Building 1803, the former golf course maintenance shop, and a nearby area which was used to store creosote cross-ties and removed railroad ballast during the 1960s and 1970s. Pesticides used at the golf course were handled in Building 1803. The site is currently a graveled area containing a considerable quantity of asphalt rubble, traces of tar, and other similar debris. Because operations at this unit were discontinued in the 1970s, little information could be located concerning the unit's design features, actual dates of operation, or operating practices.[a]	phenolic compounds, PAHs, chlorinated pesticides and herbicides, petroleum hydrocarbons, and heavy metals	**Soil** Air Soil Gas Surface water **Groundwater**

Notes:

[a] Described in the *Final RCRA Facility Assessment, June 6, 1995.*
[b] Pathways scheduled for confirmatory sampling are bold.

Site Activities

Site activities will include soil borings, soil sampling, and installing monitoring wells. Subsequent activities will include well development, purging, and sampling as required. Fieldwork for this site is described in Section 2.4.7 of this work plan.

Chemical Hazards and PPE Requirements

The COPCs at these sites are chlorinated pesticides and herbicides, petroleum products, heavy metals, and polynuclear aromatic hydrocarbons. Table 4-8 lists exposure guidelines for representative COPCs. MSDSs for these compounds are included in the MSDS Field Book for Zones A and B. MSDSs for suspected site COPCs can be accessed at the EnSafe/A&H Charleston Field Trailer. If additional COPCs are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the ZHASP.

The initial PPE level for invasive field activities performed at SWMU 42 and AOC 505 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required level of PPE shall be upgraded to Level C.

Table 4-8
SWMU 42 and AOC 505
Exposure Guidelines for Expected Site Chemical Hazards

COPC	Odor[a] Threshold	OSHA PEL[b]	ACGIH TLV[c]	NIOSH REL[d]	Ionization Potential (eV)	Flammable Range (% by Volume)
Benzene	4.68 ppm	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	9.25	1.3 to 7.1
Benzo(a) pyrene	NA	0.2 mg/m^3	Suspected Human Carcinogen	0.1 mg/m^3	NA	NA
Cadmium	NA	0.6 mg/m^3 Ceiling	0.05 mg/m^3	Potential Occupational Carcinogen	NA	NA
Chromium	NA	1 mg/m^3	0.5 mg/m^3	NA	NA	NA
Ethyl-benzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	8.8	1.0 to 6.7
Kerosene	1 ppm	NA	NA	100 mg/m^3	6.6	0.7 to 5.0

Table 4-5
SWMU 42 and AOC 605
Exposure Guidelines for Expected Site Chemical Hazards

COPC	Odor[a] Threshold	OSHA PEL[b]	ACGIH TLV[c]	NIOSH REL[d]	Ionization Potential (eV)	Flammable Range (% by Volume)
Lead	NA	0.05 mg/m^3	0.05 mg/m^3	0.1 mg/m^3	NA	NA
Mercury	NA	0.05 mg/m^3 Skin	0.05 mg/m^3 Skin	0.05 mg/m^3	NA	NA
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 STEL	8.8	1.3 to 7.1
Xylene	1 ppm	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	8.8	1.0 to 7.0

Notes:

[a] – Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
[b] – Permissible Exposure Limits (PELs) legal standards enforced by OSHA and found in 29 CFR 1910.1000.
[c] – Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, *1993 - 1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
[d] – Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
NA – Substance information not available, or substance unlisted.

4.7 SWMU 43, Publications and Printing Plant, Building 1628

SWMU 43 is Building 1628, the Publications and Printing Plant, which has been in operation since 1979. A darkroom and hazardous materials cabinets are on the ground floor of the building. The primary materials of concern for this SWMU are photograph development chemicals, including some that may contain silver. However, a 1980 report stated that Building 1628's photographic and lithographic developing solutions contained glacial acetic acid, ferric chloride, and potassium hydroxide. A NAVBASE report of potential sources of hazardous waste listed Building 1628 as potentially generating lead and chromium wastes. Table 4-9 describes this SWMU.

Before the hazardous materials storage cabinets were installed, hazardous materials were accumulated in a corrugated metal shed on a concrete pad east of the building. The CSI proposed for SWMU 43 will investigate these areas for potential releases of hazardous materials into the surrounding soil.

Table 4-9
SWMU 43
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
SWMU 43 Publications and Printing Plant, Bldg 1628	This site currently contains hazardous materials storage lockers. Before the installation of the lockers, hazardous materials were stored in a corrugated metal shed on a concrete pad east of the structure. Additionally, a concrete storage area farther east was used to store hazardous materials.[a]	silver containing developing solutions, lead, chromium, acetic acid, ferric chloride, and potassium hydroxide	**Soil** Soil Gas Surface water Groundwater Air

Notes:

[a] Described in the *Final RCRA Facility Assessment, June 6, 1995.*
[b] Pathways scheduled for confirmatory sampling are bold.

Site Activities

Site activities will include soil borings and soil sampling. Fieldwork for this site is described in Section 2.5.7 of this work plan.

Chemical Hazards and PPE Requirements

The COPCs at this site include silver-containing developing solutions, lead, chromium, acetic acid, ferric chloride, and potassium hydroxide. This site has not been investigated previously. Table 4-10 lists exposure guidelines for COPCs. MSDSs for suspected site COPCs can be accessed at the EnSafe/A&H Charleston Field Trailer. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the ZHASP.

The initial PPE level for invasive field activities performed at SWMU 43 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required level of PPE shall be upgraded to Level C.

Table 4-10
SWMU 43
Exposure Guidelines for Expected Site Chemical Hazards

COPC	Odor[a] Threshold	OSHA PEL[b]	ACGIH TLV[c]	NIOSH REL[d]	Ionization Potential (eV)	Flammable Range (% by Volume)
Acetic Acid	1 ppm	NA	NA	NA	NA	NA
Chromium	NA	0.2 mg/m^3	Suspected Human Carcinogen	0.1 mg/m^3	NA	NA
Ferric Chloride	NA	NA	NA	NA	NA	NA
Lead	NA	0.05 mg/m^3	0.05 mg/m^3	0.1 mg/m^3	NA	NA
Potassium Hydroxide		2 mg/m^3 Ceiling	2 mg/m^3 Ceiling	NA	NA	NA
Silver	NA	5 mg/m^3	5 mg/m^3 Ceiling Skin	5 mg/m^3 Ceiling	NA	NA

Notes:

[a] – Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
[b] – Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.
[c] – Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, *1993 - 1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
[d] – Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
NA – Substance information not available, or substance omitted.

4.8 AOC 506, Building 1629, Flammable Storage Shelter

AOC 506 is Building 1629, a structure used to store flammable material returned to Building 1603, the DRMO Material Turn-In Site. This unit has operated since 1942, and consists of a 21' x 30' concrete pad enclosed with a chain-link fence and covered by a metal roof. Solvents, paints, fuels, and other materials classified as flammable are accumulated within this structure. No containment structures are associated with the unit, and a release could impact the immediately adjacent unpaved areas. The CSI proposed for AOC 506 will investigate adjacent areas for potential releases. Table 4-11 describes this AOC.

Table 4-11
AOC 506
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
AOC 506 Flammable Storage Shelter, Bldg 1629	This site has been used since 1942 to store flammable material returned to Building 1603. It consists of a 21' x 30' concrete pad enclosed with a chain-link fence and covered by a metal roof. No containment structures are associated with the unit, and a release could impact the unpaved adjacent areas.[a]	Solvents, paints, fuels, and other unknown flammable materials	**Soil** Soil Gas Surface water **Groundwater** Air

Notes:

[a] Described in the *Final RCRA Facility Assessment, June 6, 1995.*
[b] Pathways scheduled for confirmatory sampling are bold.

Site Activities

Site activities will include soil borings, soil sampling, and the installation of a monitoring well with subsequent development, purging, and sampling. Fieldwork for this site is described in Section 2.6.7 of this work plan.

Chemical Hazards and PPE Requirements

The COPCs at this site include acids, solvents, heavy metals, and petroleum products. Table 4-12 lists exposure guidelines for COPC. These sites have not been investigated

previously. MSDSs for suspected site COPCs can be accessed at the EnSafe/A&H Charleston Field Trailer. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the ZHASP.

The initial PPE level for invasive field activities at AOC 506 is modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required level of PPE shall be upgraded to Level C.

Table 4-12
AOC 506
Exposure Guidelines for Expected Site Chemical Hazards

COPC	Odor[a] Threshold	OSHA PEL[b]	ACGIH TLV[c]	NIOSH REL[d]	Ionization Potential (eV)	Flammable Range (% by Volume)
Benzene	4.68 ppm	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	9.25	1.3 to 7.1
Cadmium	NA	0.6 mg/m³ Ceiling	0.05 mg/m³	Potential Human Carcinogen	NA	NA
Chloroform	205 ppm	2 ppm	10 ppm Suspected Human Carcinogen	2 ppm Potential Occupational Carcinogen	11.4	NA
Chromium	NA	1 mg/m³	0.5 mg/m³	NA	NA	NA
Ethyl-benzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	8.8	1.0 to 6.7
Lead	NA	0.05 mg/m³	0.05 mg/m³	0.1 mg/m³	NA	NA
perchloroethylene	5 ppm	25 ppm	25 ppm 100 ppm- STEL	Potential Occupational Carcinogen	9.3	NA
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	8.8	1.3 to 7.1
Xylene	NA	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	8.6	1.0 to 7.0

Notes:

[a] – Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
[b] – Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.
[c] – Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, *1993 - 1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
[d] – Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
NA – Substance information not available, or substance unlisted.

4.9 AOC 507, Oil Storehouse, Former Building 1010

AOC 507 is former Building 1010, an oil storehouse that was demolished more than 80 years ago. Therefore, no records were available regarding the structure's design, dates of operation, or operating practices. The site of the former oil storehouse is part of the NAVBASE golf course, southwest of the fairway for the ninth hole. Recent information indicates that the building was near the end of the cul-de-sac in this area. Typical materials that would have been stored in this unit include POLs. Due to the unit's period of operation, it is unlikely that containment structures existed or that current spill cleanup procedures were used. Therefore, potential releases could have impacted surrounding unpaved areas. The CSI proposed for AOC 506 will investigate adjacent soil for potential releases. Table 4-13 describes this AOC.

Table 4-13
AOC 507
Site Description

Number	Description	Materials of Concern	Potential Pathways[b]
AOC 507, Oil Storehouse, Former Bldg. 1010	This site was demolished more than 80 years ago, and little information was available regarding the building's specifications or use during the period of operation. New research indicates that the structure was at the end of a cul-de-sac, southwest of the fairway for hole #9. Due to the period of operation, it is unlikely that containment and spill cleanup procedures were in place. A release could impact the surrounding unpaved property.[a]	POLs	**Soil** Soil Gas Surface water Groundwater Air

Notes:

[a] Described in the *Final RCRA Facility Assessment, June 6, 1994.*
[b] Pathways scheduled for confirmatory sampling are bold.

Site Activities

Site activities will include soil borings and soil sampling. Fieldwork for this site is described in Section 2.7.7 of this work plan.

Chemical Hazards and PPE Requirements

The RFA performed by E/A&H indicated that numerous chemicals were stored and used at AOC 507. The major COPCs are solvents and petroleum products. Table 4-14 lists exposure guidelines for COPCs. MSDSs for suspected site COPCs can be accessed at the EnSafe/A&H Charleston Field Trailer. If additional contaminants of concern are discovered during the investigation, MSDSs will be immediately obtained, reviewed, and incorporated into the ZHASP.

The initial PPE level for invasive field activities performed at this AOC will be modified Level D. The AL for this site is a continuous PID reading of 5 ppm or greater in the breathing zone. If this occurs, the required level of PPE shall be upgraded to Level C.

Table 4-14
AOC 507
Exposure Guidelines for Expected Site Chemical Hazards

COPC	Odor[a] Threshold	OSHA PEL[b]	ACGIH TLV[c]	NIOSH REL[d]	Ionization Potential (eV)	Flammable Range (% by Volume)
Benzene	4.68 ppm	1 ppm 5 ppm STEL	0.1 ppm Confirmed Human Carcinogen	0.1 ppm 1 ppm STEL Potential Occupational Carcinogen	9.25	1.3 to 7.1
Ethyl-benzene	140 ppm	100 ppm 125 ppm STEL	100 ppm 125 ppm STEL	NA	8.8	1.0 to 6.7
Hexane	130 ppm	500 ppm 1000 ppm STEL	50 ppm	100 ppm	10.2	1.1 to 7.5
Tetraethyl Lead	NA	0.075 mg/m^3 Skin	0.075 mg/m^3 Skin	<0.1 mg/m^3	11.1	>1.8
Toluene	40 ppm	100 ppm 150 ppm STEL	50 ppm	100 ppm 150 ppm STEL	8.8	1.3 to 7.1
Xylene	NA	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	100 ppm 150 ppm STEL	8.6	1.0 to 7.0

Notes:

[a] – Odor Thresholds for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.
[b] – Permissible Exposure Limits (PELs) are legal standards enforced by OSHA and found in 29 CFR 1910.1000.
[c] – Threshold Limit Values, and Short Term Exposure Limits (TLVs and STELs) are recommended exposure guidelines developed by the American Conference for Governmental Industrial Hygienists (ACGIH), and published annually. For this site, *1993 - 1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* was used.
[d] – Recommended Exposure Limits (RELs) are non-enforceable exposure guidelines developed by the National Institute of Occupational Safety and Health Administration (NIOSH) to support OSHA. *NIOSH Pocket Guide to Chemical Hazards, June 1990.*
NA – Substance information not available, or substance unlisted.

4.10 Zone Physical Hazards

Field personnel should be aware of and act in a manner to minimize the dangers associated with physical hazards typically encountered during environmental investigations. These hazards include heat-related illnesses, severe weather, aboveground utilities, working with and around drill rigs and heavy equipment, uneven terrain, slippery surfaces, and lifting.

4.10.1 Underground Utilities

A major safety concern in environmental investigations is drilling into underground utilities, particularly electrical and natural gas lines. Before drilling or conducting an intrusive activity with the potential to penetrate a utility line, at a minimum, the following steps must be taken at each location, for each well or penetration:

- Conduct a surface resistivity and magnetic survey to locate underground utilities.
- Offset drilling location from located utility allowing a minimum of 5 feet.
- Core asphalt and concrete.
- While drilling, post hole digging and hand auguring in areas where the location of underground utilities is not clear or off-setting is not possible. The individual(s) actually doing the invasive work shall wear boots and gloves that provide electrical insulation.

4.10.2 Procedures for Hot or Cold Weather Conditions

The Site Supervisor and the Site Health and Safety Officer (SHSO) shall be aware of the potential for heat stress and other environmental illnesses. When necessary, work regimens shall be implemented that minimize the potential for employee illness. At these times field staff need to be reminded to regularly look at their co-workers for signs or symptoms of heat- or

cold-induced illness. For a discussion of the more common heat- and cold-related illnesses and their associated symptoms see CHASP Section 6.5.1.

Of heat stress conditions (area and/or personal) will be monitored during hot weather and/or when elevated levels of PPE are used. When the oral temperature of field staff reaches or exceeds 100°F they shall rest until their temperature drops below 99°F. The oral temperature of field staff should not exceed 100.4°F as specified by the American Conference of Governmental Industrial Hygienist (ACGIH) [Threshold Limit Values (TLVs) and Biological Indices (BIs) for 1994-5, Cincinnati, OH, ACGIH 1994, pp 84-90). Rather than measuring oral temperatures which can be influenced by external factors such as breathing through one's mouth, temperature measurements using infrared measurements of the tympanic membrane will be used as oral temperature equivalents.

4.10.3 Severe Weather Conditions

Fieldwork shall not be conducted when lightning can be seen from the work area. During extreme weather conditions the Site Supervisor shall use his/her best professional judgement and has the authority to stop field-work or dismiss workers for the day. Examples of conditions that may warrant work stoppage include: high winds, hail, flooding, and ice storms. In the event of severe weather (e.g., lightning) or an emergency requiring immediate evacuation, contaminated equipment will be bagged or wrapped and taped in 6 mil polyethylene sheeting and tagged as "contaminated" for later decontamination.

4.10.4 Radiation Protection

Radioactive materials/hazards are potentially present within Zones A and B as a result of past operational activities at the Charleston Naval Shipyard (CNSY).

As a part of the CNSY and the Charleston Naval Base closure process, the Navy is required to conduct radiological surveys to verify that all material has been removed.

Prior to E/A&H and contractors performing any of the below actions, the CNSY General Survey Project Superintendent of Zones A and B shall be contacted by E/A&H employees and contractors to determine if the CNSY verification surveys have been completed in Zones A and B. Once completion of the surveys has been verified, work may be performed in the verified areas with no radiological precautions required. This applies to all E/A&H employees and their contractors while conducting field work in Zones A and B, including but not limited to walkover investigations, drilling, well development, soil sampling, water sampling, and trenching.

4.10.5 Working Around Drill Rigs and Heavy Equipment

Heavy equipment and drill rig operations will be performed in accordance with the procedures outlined in the CHASP Appendix F, Drilling Safety Guide.

4.11 Employee Protection

Employee protection for this project is addressed in several ways including the use of: work limitations (Section 4.11.1), selection of personal protective equipment (Section 4.11.2), air monitoring (Section 4.11.3), establishment of action levels (Section 4.11.3), personnel and equipment decontamination procedures (Section 4.12), standard safe work practices (Section 4.13) and general rules of conduct (Section 4.14).

4.11.1 Work Limitations

All site activities will be conducted during daylight only. All personnel scheduled for these activities will have completed initial health and safety training and actual field training as specified in 29 CFR 1910.120(e). All supervisors must complete an additional eight hours of HAZWOPER Site Supervisor training. All personnel must complete an eight-hour refresher training course annually to continue working onsite.

4.11.2 Selection of Personal Protective Equipment

It is important that specified PPE protects against known and suspected site hazards. Protective equipment is selected based on the types, concentrations, and routes of personal exposure that may be encountered. In situations where the types of materials and possibilities of contact are unknown or the hazards are not clearly identifiable, a more subjective determination must be made of the PPE required, and a greater emphasis is placed on experiences and sound safety practices.

PPE requirements are subject to change as site information is updated or changes. **A decision to deviate from specified levels of PPE as contained in this ZHASP must be made or reviewed by the Project Health and Safety Officer (PHSO).**

Initial Level of Personal Protective Equipment

Based on the best available information, the appropriate level of PPE for initial site entry is modified Level D. Modified Level D shall be the initial PPE for work activities that disturb the soil or could result in personnel coming into contact with contaminated soil, sediment, groundwater, or surface water. This level of protection was selected because the concentrations of contaminants detected in the previous studies were low and free product was not detected. Modified Level D protection consists of a hard hat, chemical-resistant coveralls and gloves (vinyl or nitrile), eye protection, and steel-toed and shank boots.

Examples of activities to be initiated in Modified Level D include: soil boring, well installation and construction, soil sampling, and well development. Collecting groundwater samples and determining water levels are two field activities which can be conducted in Level D, as long as field personnel supplement their Level D attire with nitrile gloves (outer gloves, not the 4 mil nitrile inner glove liners).

4.11.3 Air Monitoring

Air monitoring using a PID and/or other appropriate sampling equipment will be conducted before to beginning field activities at a new EZ and during ground-disturbing activities. The PID will be field calibrated to measure volatile organic compounds (VOCs) relative to a 100 ppm isobutylene standard. If VOCs are detected down-hole, colorimetric detector tubes and/or other sampling techniques may be used to determine the identification and approximate concentration of these compounds.

The PHSO reserves the right to require personal exposure monitoring or other types of air sample collection and analysis. These samples may be required for a variety of reasons such as: to identify a chemical odor, PID readings exceed or approach the action level, or to determine if personal exposures are below Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs).

A combustible gas indicator (CGI) will be used during all soil borings and well installations. The CGI will be field calibrated to measure flammable gases relative to a methane standard. Down-hole CGI readings will be collected periodically during soil-disturbing operations. Field activities will immediately cease if down-hole readings exceed 20 percent of the lower explosive limit (LEL). If CGI readings do not subside, the area will be immediately evacuated and the situation re-evaluated to determine how to proceed. The area will investigated; operations may not proceed until down-hole readings are below 20 percent LEL.

Action Level and Ceiling Concentration

Each site at NAVBASE has a designated action level and ceiling concentration. For this project the AL is defined as the PID reading in the breathing zone above which respiratory protection must be upgraded; chemical protective clothing may also be upgraded. The AL is determined on a site-by-site basis. To exceed the AL, PID readings should be sustainable. Readings should remain above the AL for at least one or two minutes at a time. Readings that are elevated for

only a few seconds every 15 or 20 minutes do not exceed the AL and do not require workers to upgrade their level of PPE.

The general AL for this zone, as determined on a properly calibrated PID, is 5 PID units above background. This action level was selected after reviewing available site-specific information and previous sampling data for each site in Zones A and B. If additional information becomes available, the AL for this zone or specific sites may be revised. If the AL is exceeded, PPE shall be upgraded to Level C (assuming that cartridge respirators are appropriate, otherwise Level B) if airborne VOC concentrations in the breathing zone exceed the AL, or if the concentration of any contaminant exceeds 50 percent of the OSHA PEL.

If breathing zone concentrations exceed the AL, or site conditions indicate that additional health and safety precautions are needed, field activities in the area shall stop. Field staff shall notify the Site Supervisor of the situation and he/she shall contact the Project Manager and/or the PHSO. The PHSO will be responsible for reassessing the hazards and prescribing revised health and safety requirements as necessary, including upgraded PPE requirements, revised work schedules, and revised decontamination procedures. See Table 4-15 for specific criteria for each protection level.

If PID readings exceed 10 units, the SHSO shall contact the PHSO and discuss the need to identify and quantify airborne contaminants. Work shall not proceed until breathing zone concentrations return to background levels and it is reasonably anticipated that breathing zone readings will stay approximately at background, or the chemical constituent(s) are identified and appropriate PPE is donned.

The ceiling concentration is defined as the maximum allowable PID reading in the breathing zone regardless of PPE. A ceiling concentration of 50 PID units has been established. Should VOC concentrations exceed 50 ppm in the breathing zone, field workers should secure their

equipment and back off the site. Work shall not resume until the Site Supervisor understands why VOC concentrations became elevated, knows the major constituents of the VOCs being generated, and the VOCs in the breathing zone are less than 5 ppm or workers have upgraded

Table 4-15
Level of Protection and Criteria

Level of Protection	Criteria for Use	Equipment
Level A	• When atmospheres are "immediately dangerous to life and health" (IDLH in the NIOSH/OSHA Pocket Guide to Chemical Hazards or other guides.) • When known atmospheres or potential situations exist that could affect the skin or eyes or be absorbed into the body through these surfaces. Consult standard references to obtain concentrations hazardous to skin, eyes, or mucous membranes. • Potential situations include those where immersion may occur, vapors may be generated or splashing may occur through site activities. • Where atmospheres are oxygen-deficient. • When the type(s) and or potential concentration of toxic substances are not known.	• Positive-pressure full-face piece self-contained breathing apparatus (SCBA) or positive-pressure supplied air respirator with escape SCBA. • Fully-encapsulating chemical protective suit. • Chemical-resistant inner and outer gloves. • Steel toe and steel shank chemical-resistant boots. • Hard hat under suit. • Two-way radios worn inside suit. • Optional: coveralls, long cotton underwear, disposable protective suit, gloves and boots, over fully encapsulating suit.
Level B	• When respiratory protection is warranted and cartridge respirators are not appropriate. Examples of these conditions are: — when work area may contain less than 19.5 percent oxygen, — when expected contaminants do not have appropriate warning properties e.g. vinyl chloride, or — when cartridges are not available to protect against all COPCs. • Hazards associated with limited dermal exposure are not significant.	• Chemical-resistant clothes, coveralls. • Positive-pressure full-face, SCBA or supplied airline system (SAR) with escape bottle. • Hard hat. • Chemical-resistant outer and inner gloves. • Steel toe and steel shank boots. • Chemical-resistant outer boots.
Level C	• When respiratory protection is warranted and cartridge respirators are appropriate. • When PID readings exceed the Action Level. • When air monitoring indicates airborne concentration of a chemical is 50 percent or more of the PEL or TLV • And the work area contains at least 19.5 percent oxygen.	• Chemical-resistant coveralls. • Full-face, air-purifying respirator equipped with cartridges suitable for the hazard. • Hard hat. • Chemical-resistant outer and inner gloves. • Steel toe and steel shank boots. • Disposable outer boots.

Table 4-15
Level of Protection and Criteria

Level of Protection	Criteria for Use	Equipment
Modified Level D	• When chemical contamination is known or expected to be present, yet inhalation risk is low and respiratory protection is not required. • Site contaminants may be absorbed through the skin. • The "default level" of PPE required when the ZHASP does not specify another level of PPE. • And the work area has at least 19.5 percent oxygen.	• Chemical-resistant coveralls. • Chemical-resistant outer gloves; inner gloves or glove liners, optional. • Steel toe and steel shank boots. • Hard hat. • Safety glasses with side shields or safety goggles. • Optional: chemical-resistant outer boots.
Level D	• When minimal or no chemical contamination is expected. • When ZHASP specifies Level D protection is adequate. • And the work area has at least 19.5 percent oxygen.	• Inner gloves or chemical-resistant gloves needed to handle soil or water samples. • Steel toe and steel shank boots. • Hard hat. • Safety glasses with side shields or safety goggles. • Optional: coveralls and disposable outer boots. • Work clothes.

to Level C or B. The proper PPE upgrade shall be determined by the PHSO based on site-specific chemical information, i.e., is there enough information to determine that air-purifying respirators will provide sufficient protection.

Field monitoring values will be recorded in a field logbook and copies must be posted for field personnel review.

Equipment Maintenance

Before being used daily, PIDs, CGIs, and other monitoring equipment shall be calibrated or their proper function verified. Throughout the day this equipment shall be periodically checked to ensure it is working properly. A final calibration shall be conducted at the end of the work day, at which time each instrument will be checked to ensure that it is free from surface contamination. Air monitoring equipment shall detect the calibration standard within a range of plus or minus 10 percent, otherwise the instrument shall be considered to be malfunctioning. Field staff shall note in their field notebooks that they conducted these calibrations and checks

and note whether the equipment was functioning properly. When equipment is not functioning properly it should be brought to the attention of the Site Supervisor or SHSO, who will arrange for repairs and/or replacement of that equipment as needed.

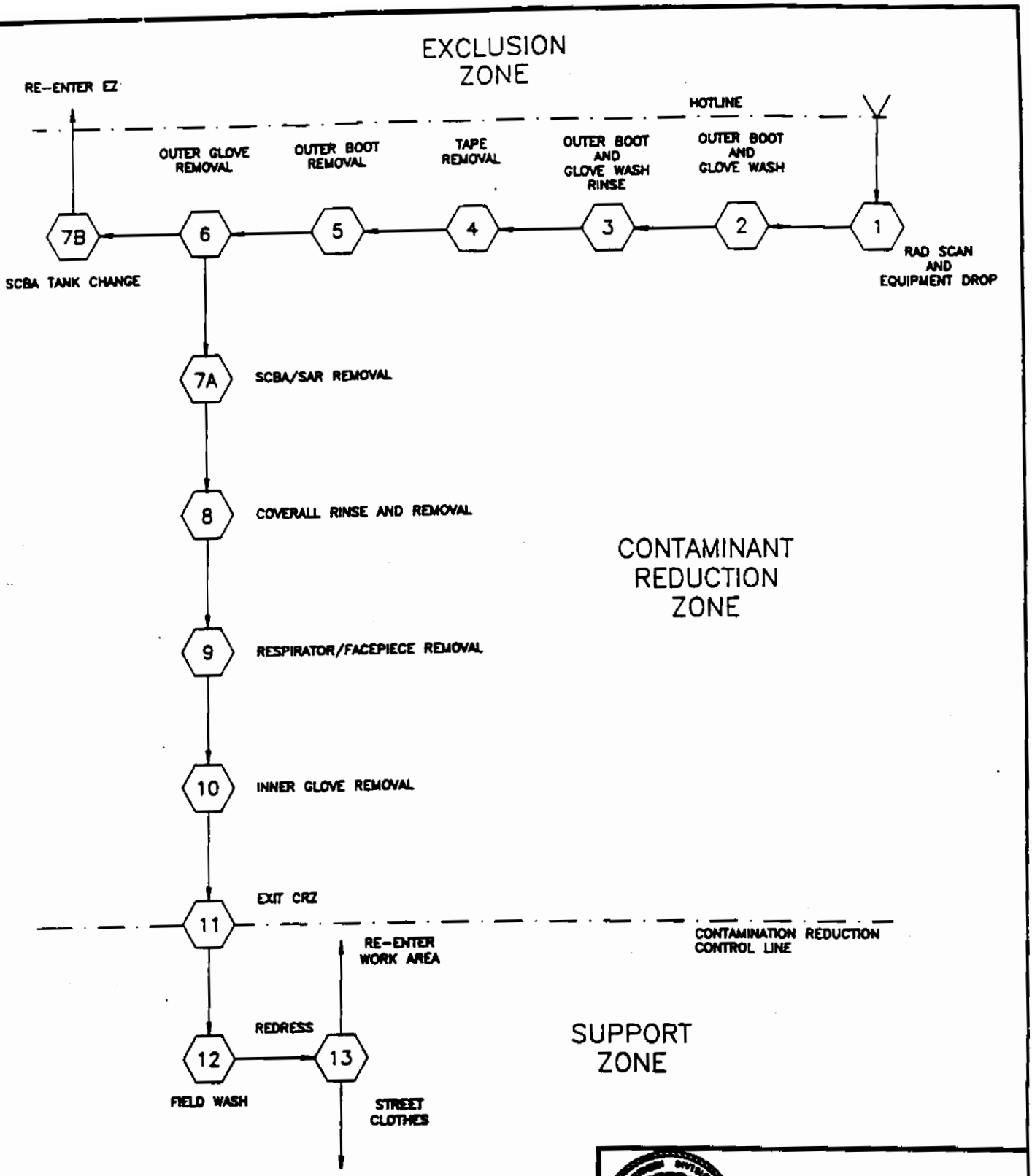
4.12 Personnel and Equipment Decontamination

As needed, a CRZ will be established adjacent to EZs established for invasive activities, and will include stations for decontaminating personnel, PPE, and hand tools. Typically, a portion of the CRZ will be covered with sheets of 6-mil polyethylene (generally, an area 20 feet by 20 feet is sufficient) with specific stations to accommodate the removal and disposal of the protective clothing, boot covers, gloves, and respiratory protection.

Heavy equipment and field equipment that cannot adequately be decontaminated in the CRZ may be decontaminated on a more centrally located decontamination pad. Table 4-16 lists equipment that may be convenient to have onsite to decontaminate heavy equipment and vehicles; this table also explains how to use this equipment.

Figure 4-1 shows one method of laying out an acceptable decontamination area for Level B PPE. There are numerous ways to lay out decontamination areas. Decontamination areas for Level C and Modified D PPE should be based on this concept of decontamination, but can be scaled back in accordance with the decontamination needs of the specific site and level of PPE. As a general rule, people working in the CRZ, assisting in the decontamination of workers leaving the EZ, shall be outfitted in PPE that is one protection level below what the exiting workers are using. For example, if workers leave the EZ in Level C, personnel in the CRZ should be in Modified D.

Often equipment may be adequately decontaminated using a soapy wash solution and following specified rinsing procedures. Normally equipment decontamination will be completed in



NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 4-1
FULL DECONTAMINATION LAYOUT
LEVEL B PROTECTION

DWG DATE: 10/19/94 | DWG NAME: 29FDLLP

Table 4-16
Equipment Recommended for Decontaminating Heavy Equipment and Vehicles

- Storage tanks or drums to be used for storing collected wash and rinse solutions, alternatively, equipment for the treatment of collected wash and rinse solutions may be substituted.
- Pumps and filters as needed to collect wash and rinsate solutions.
- Pressurized steam sprayers for steam cleaning equipment.
- Long-handled brushes for general cleaning of exterior surfaces. Also shovels and other equipment may be used to dislodge caked-on contaminated mud that may be present on the undercarriage or in the tires.
- Wash solutions, selected for their ability to remove (dissolve, etc.) contaminants
- Rinse solutions, selected for their ability to remove contaminants and wash solutions.
- Pressurized sprayers for washing and rinsing, particularly hard to reach areas.
- Clean buckets that can contain cleaning and rinsing solutions.
- Brooms and brushes that can be used to clean the interior, operator areas of vehicles and equipment.

Level D with gloves or Modified D PPE. Respirators not only need to be decontaminated and cleaned between uses, but also need to be sanitized. Alcohol swabs are generally sufficient.

In the event of inclement weather (e.g., lightning) or an emergency requiring immediate evacuation, contaminated equipment will be bagged or wrapped and taped in 6 mil polyethylene sheeting and tagged as "contaminated" for later decontamination.

4.12.1 Full Decontamination Procedures

Workers shall use the following cleaning and decontamination procedures when exiting the EZ. These procedures should be followed when workers are leaving the area for lunch, at the end of their shift or when work is completed for an EZ. Procedures for rest breaks, changing SCBA tanks and cartridges are described in Section 4.12.2. Not all steps apply to every

situation; follow applicable procedures. Decontamination procedures shall start at the EZ/CRZ interface and continue away from the EZ towards the SZ.

Full Decontamination

1. ***Equipment drop***. Deposit used equipment onto plastic drop cloths or into a plastic-lined tub. All gross contamination should be removed here; fine cleaning and decontamination of equipment may be completed here or elsewhere. Before moving equipment that is still contaminated, it must be wrapped and taped.

2. ***Outer boot and glove wash***. Wash/remove gross contamination from outer boots, outer gloves, self contained breathing apparatus (SCBA) and/or supplied air respirator (SAR).

3. ***Tape removal***. Remove tape from ankles and wrists and dispose of in plastic-lined drum.

4. ***Outer boot removal***. Remove outer boots; disposable outer boots may be disposed of in the same waste container used in Step 3. Non-disposable boots need a thorough cleaning before they can be removed from the site. (If non-disposable boots are used, it is preferable to have them dedicated to the project.)

5. ***Outer glove removal***. Remove and dispose of outer gloves. Gloves may be disposed of in the same waste container as used in Step 4.

6. ***SCBA and SAR removal***. For Level B*.

   SCBA — With buddy or other site worker, remove backpack, remove face piece, and shut off air flow.

   Airline — With buddy or other site worker, remove harness and escape bottle, remove face piece, shut off air flow.

* If coveralls are significantly contaminated, leave the respirator face piece on, disconnect the air hose just downstream of the regulator, turn off the flow of air, remove the backpack or equipment harness, and leave the face piece in place. Remove the face piece in Step 8.

7. ***Coverall removal.*** Rinse coveralls, if needed; remove coveralls and dispose of them. The same drum may be used as in Step 4. Non-disposable coveralls shall be double-bagged with the outer bag clearly labeled "contaminated."

8. ***Respirator removal.*** Remove respirator (or face piece of Level B equipment, if it is still being worn). Dispose of spent cartridges, clean, disinfect, dry, and properly store respirator or face piece.

9. ***Inner glove removal.*** Remove and dispose of inner gloves.

10. ***Exit area.*** Exit the CRZ via the SZ.

11. ***Field Wash.*** Wash and rinse hands and face.

12. ***Redress.*** Redress into appropriate PPE for re-entry or change into street clothes.

Notes:

- All wastes (soil and water) generated during personal decontamination will be collected in 55-gallon drums. The drums will be labeled by E/A&H personnel; final disposal will be by the Navy.

- Hard hats and eye protection should be washed at the end of each workday with a soap and water solution.

4.12.2 Partial Decontamination Procedures

To change a respirator cartridge or SCBA tank:

1. ***Outer boot and glove wash.*** Wash outer boots and gloves. Wash/remove gross contamination from SCBA and/or SAR equipment.

2. ***Tape removal.*** Remove tape from ankles and wrists and dispose of it in a plastic-lined drum.

3. ***Face piece removal.*** Disconnect face piece and air hose just downstream of regulator. The face piece may remain in place, or be removed and cleaned. Remove the spent tank from the backpack and replace it with a full tank. Connect air hose and turn on air.

4. ***Respirator removal.*** Remove respirator, remove used cartridges, clean and disinfect respirator, install new cartridges, and don respirator.

5. ***Respirator check.*** Check to make sure that respirator still seals properly to your face.

6. ***Don clean PPE.*** Put on clean outer gloves, tape wrists (as applicable), and re-enter EZ.

When taking a rest break:

1. ***Outer boot and glove wash.*** Wash outer boots and gloves. Wash-remove gross contamination from SCBA and/or SAR equipment.

2. ***Tape removal.*** Remove tape from ankles and wrists and dispose of it in a plastic-lined drum.

3. ***Respirator removal.*** Remove SCBA unit, airline harness or respirator, and place in a clean area; plastic sheeting may be needed.

4. ***Coverall removal.*** Remove outer wear if it is ripped or significantly contaminated. In hot weather, at least unzip and pull down upper half of coveralls.

5. ***Inner glove removal.*** Remove and dispose of inner gloves.

6. ***Wash.*** Wash and rinse hands and face at the field wash station.

7. ***Rest break.*** Take rest break; remember to drink plenty of water, Gatorade, or other similar beverage.

8. ***Don inner gloves.*** Put on inner gloves.

9. ***Don PPE.*** Don coveralls, outer boots, and outer gloves. Tape wrists and ankles (as needed) and re-enter the EZ.

Decontamination procedures, based on Level D protection:

- Brush heavily soiled boots and rinse outer gloves and boots with soap and water.
- Remove gloves and deposit them in a trash container.
- Discard gloves and other disposable PPE in a trash container.
- Wash hands and face, and preferably shower as soon as practical.

4.12.3 Closure of the Decontamination Station

All disposable clothing and plastic sheeting used during site activities at sites with Level D through Level C will be double-bagged and disposed of in a refuse container. Decontamination and rinse solutions and disposable PPE from Level B site will be placed in a labeled 55-gallon drum (separate solids and liquids) for later analysis and disposal. All washtubs, pails, buckets, etc. will be washed and rinsed at the end of each workday.

4.13 Standard Safe Work Practices

- Eating, drinking, chewing gum or tobacco, smoking, or any activity that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated, unless authorized by the SHSO.

- Hands and face must be thoroughly washed upon leaving the work area.

- No contact lenses will be worn in work areas while invasive activities are conducted.

- Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as practical after leaving the CRZ.

- Contact with contaminated or suspected contaminated surfaces should be avoided. Whenever possible, do not walk through puddles, leachate, or discolored surfaces, or lean, sit, or place equipment on drums, containers, or on soil suspected of being contaminated.

- Medicine and alcohol can exacerbate the effects from exposure to toxic chemicals. Prescribed drugs should not be taken by personnel on cleanup or response operations where the potential for absorption, inhalation, or ingestion of toxic substances exists unless specifically approved by a qualified physician. Consumption of alcoholic beverages is prohibited.

- Adequate side and overhead clearance must be maintained to ensure that the drill rig boom does not touch or pass close to any overhead power lines or other overhead obstacles or obstructions.

- NAVBASE Public Works and local utility representatives shall be contacted and requested to identify all underground utility lines. Utility lines should be marked using characteristic spray paint or labeled stakes. A buffer zone, 3 yards to either side of a utility line, should be maintained during all subsurface investigations.

- Due to the flammable properties of the potential chemical hazards, all spark or ignition sources should be bonded and/or grounded or mitigated before soil boring advancement or other site activities begin.

4.14 General Rules of Conduct

- Liquor, firearms, narcotics, tape recorders, and other contraband items are not permitted on the premises.

- Any violation of local, state, or federal laws, or conduct which is outside the generally accepted moral standards of the community is prohibited.

- Violation of the Espionage Act, willfully hindering or limiting production, or sabotage is not permitted.

- Willfully damaging or destroying property, or removing government records is forbidden.

- Misappropriation or unauthorized altering of any government records is forbidden.

- Securing government tools in a personal or contractor's tool box is forbidden.

- Gambling in any form, selling tickets or articles, taking orders, soliciting subscriptions, taking up collections, etc. is forbidden.

- Doing personal work in government shop or office, using government property or material for unauthorized purposes, or using government telephones for unnecessary or unauthorized local or long distance telephone calls is forbidden.

- Compliance with posted signs and notices is required.

- Boisterousness and noisy or offensive work habits, abusive language, or any verbal, written, symbolic, or other communicative expression which tends to disrupt the work or morale of others is forbidden.

- Fighting or threatening bodily harm to another is forbidden.

- Defacing any government property is forbidden.

- Wearing shorts of any type and/or offensive logos, pictures, or phrases on clothing is forbidden. Shirts, shoes and pants or slacks, or coverall-type garments will be worn at all times on government property.

- All persons operating motor vehicles will obey all NAVBASE traffic regulations.

4.15 Medical Monitoring Program

See CHASP Section 7.

4.16 Authorized Personnel

Personnel anticipated to be onsite at various times during site activities include:

- Engineer-in-Charge — Matthew A. Hunt (SOUTHDIV)
- Site Contact — Amos Webb (NAVBASE)

• Principal-In-Charge	James Speakman (E/A&H)
• Manager, Charleston Operations	Todd Haverkost (E/A&H)
• Task Order Manager/Project Manager	Lawson Anderson (E/A&H)
• Project Health & Safety Officer	John Borowski (E/A&H)
• Site Supervisor	Mark Hancher (E/A&H)
• Site Health & Safety Officer	Tim McCord (E/A&H)

Responsibilities of Key Field Staff

Key field staff for this project, in terms of health and safety are:

- Site Supervisor
- Site Health and Safety Officer
- (All) Field Staff

The primary health and safety responsibilities associated with each of these positions are delineated in CHASP, Sections 8.1, 8.2, and 8.3, respectively.

4.17 Emergency Information

All hazardous waste site activities present a risk to onsite personnel. During routine operations, risk is minimized by establishing good work practices, staying alert, and using proper PPE. Unpredictable events such as physical injury, chemical exposure, or fire may occur and must be anticipated.

If any situation or unplanned occurrence requires outside emergency, immediately call the appropriate contact from the following list:

Contact	Agency or Organization	Telephone
Amos Webb	NAVBASE Charleston, Site Contact	(803) 743-5519

Contact	Agency or Organization	Telephone
Matthew A. Hunt	SOUTHDIV	(803) 743-0525
Law Enforcement	NAVBASE Security	(803) 743-5555
Fire Department	NAVBASE Fire Department	(803) 743-5333
Ambulance Service	NAVBASE Ambulance	(803) 743-5444
Hospital	Charleston Naval Hospital Baker Hospital	(803) 743-7000 (803) 744-2110
Poison Control	Southern Poison Control Center	(800) 922-1117
Lawson Anderson	EnSafe/Allen & Hoshall, Task Order Manager	(901) 372-7962
John Borowski	EnSafe/Allen & Hoshall, PHSO	(901) 372-7962

* Use Charleston Naval Hospital for (potentially) life-threatening situations. For medical needs that are less urgent, the naval hospital will not serve civilians; Baker Hospital is the next closest appropriate medical facility.

Should an emergency occur or a potential emergency becomes a possibility, the following persons shall be fully apprised of the situation a soon as practical: Amos Webb, NAVBASE; Matthew Hunt, SOUTHDIV Engineer-in-Charge; Todd Haverkost, E/A&H Manager, Charleston Operations; Lawson Anderson, Project Manager; and John Borowski, E/A&H PHSO. Other persons, as appropriate, may also need to be contacted.

4.17.1 Site Resources

A cellular telephone will be available in the SZ for routine and emergency communication/ coordination with NAVBASE, SOUTHDIV, and the E/A&H field office. First-aid and eye wash equipment will be available at the work area and in each field vehicle.

4.17.2 Emergency Procedures

Examples of an emergency include:

- A fire, explosion, or similar event at or near the site whether related to this project or not;
- A member of the field crew sustains a significant injury, or experiences symptoms of a chemical exposure; or
- The discovery of a condition which suggests that site conditions are imminently more dangerous or hazardous than anticipated.

If an emergency occurs, follow these procedures:

- If it is necessary to evacuate the area, immediately proceed to a rally point and remain there until instructed otherwise.
- Use planned escape routes.
- If a member of the field team experiences effects or symptoms of exposure while on the scene, the field crew will immediately halt work and act according to the instructions provided by the Site Supervisor or, in his absence, the SHSO.
- For applicable site activities, including all Level B activities, use wind indicators to continuously indicate downwind or preferred escape routes, from upwind routes.
- Investigate condition(s) suggesting that site conditions may be more hazardous than anticipated. The condition observed and the decisions made shall be recorded in the safety logbook, or in the field logbook if no safety logbook is being maintained. If there

are doubts about how to proceed, suspend work and leave the work area until the PHSO has evaluated the situation and appropriately instructed the field team.

- If an accident occurs, the Site Supervisor is to complete an Accident Report Form (Appendix H) for submittal to the managing Principal-in-Charge of the project.

- If a member of the field crew suffers a personal injury, the SHSO will call **NAVBASE Fire Department 743-5333 or 5444** if an ambulance is needed. Next alert appropriate emergency response agencies as the situation dictates. Complete an Accident Report Form for any such incident.

- If a member of the field crew suffers chemical exposure, flush the affected areas immediately with copious amounts of clean water, and if the situation dictates, the SHSO should alert appropriate emergency response agencies, or personally ensure that the exposed individual is transported to the nearest medical treatment facility for prompt treatment. (See Appendix G for directions to the emergency medical facility.) An Accident Report Form will be completed for any such incident.

Directions to the nearest emergency medical facility capable of providing general emergency medical assistance and treating chemical burns are provided in Appendix G of this work plan.

4.18 Forms

The following forms will be used in implementing this Health and Safety Plan:

- Plan Acceptance Form
- Plan Feedback Form
- Exposure History Form
- Accident Report Form

A ZHASP Plan Acceptance Form will be filled out by all employees working onsite before site activities begin. The Plan Feedback Form will be filled out by the SHSO and any other onsite employee who wishes to fill one out. The Exposure History Form will be completed by both the Field Project Manager and the individual(s) for whom the form is intended. Examples of each form are provided in Appendix H of this plan.

All completed forms must be returned to the Task Order Manager at EnSafe/Allen & Hoshall, Memphis, Tennessee.

5.0 SIGNATORY REQUIREMENT

Condition I.E. of the Hazardous and Solid Waste Amendments (HSWA) portion of RCRA Part B Permit (EPA SCO 170 022 560) states: *All applications, reports, or information submitted to the Regional Administrator shall be signed and certified in accordance with 40 CFR §270.11.* The certification reads as follows:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Commander,
Charleston Naval Shipyard

Date

6.0 REFERENCE LIST

Ebasco Services, Inc. August 1987. *Interim RCRA Facility Assessment of USN Charleston Naval Shipyard.*

EnSafe/Allen & Hoshall. April 21, 1995. *Comprehensive Corrective Action Management Plan.*

EnSafe/Allen & Hoshall. August 30, 1994. *Final Comprehensive RFI Work Plans, Volumes I through V.*

EnSafe/Allen & Hoshall. June 6, 1995. *Final RCRA Facility Assessment for Naval Base Charleston, Volumes I and II.*

Environmental Science and Engineering, Inc. May 1983. *Initial Assessment Study for the Charleston Naval Base.*

Environmental Science and Engineering, Inc. October 1986. *Final Contamination and Exposure Assessment For the Lead Contamination Within the Defense Reutilization and Management Office.*

Park, Drennan A., *The Groundwater Resources of Charleston, Berkeley and Dorchester Counties,* South Carolina Water Resources Commission, Report No. 139, 1985.

United States Environmental Protection Agency. Permit, USEPA I.D. No. SCD 170 022 260

United States Environmental Protection Agency. Region IV. Environmental Services Division. February 1, 1991. *Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual.*

N:\WP51\MWH\ZONESAB*.*

APPENDIX A

ZONES A and B SWMU/AOC SUMMARY

Naval Base Charleston
Solid Waste Management Unit Summary
December 1994

SWMU Number	Unit Definition	SWMU Name	Materials Released, Stored, or Disposed	Investigative Approach	Location	Study Zone
1	SWMU	DRMO Storage Area	Hazardous Waste Lead	RFI	DRMO	A
2	SWMU	Lead Contamination Area	Lead	RFI	DRMO	A
38	SWMU	Miscellaneous Storage, North of Building 1605	Waste Oil	CSI	North of Building 1605	A
39	SWMU	POL Drum Storage	Petroleum Products	RFI	North of Building 1604	A
40	SWMU	Building 1640 DRMO	Hazardous Wastes	RU	Building 1640	A
42	SWMU	Former Asphalt Plant/Tanks Boiler Plant	Asphalt Products Solvents Degreasers	CSI	NW of Building 1803	A
43	SWMU	Building 1628 Publications and Printing Plant	Chromium Lead	CSI	Building 1628	A

Naval Base Charleston Area of Concern Summary December 1994							
AOC Number	**Unit Definition**	**AOC Name**	**Materials Released, Stored, or Disposed**	**Investigative Approach**	**Location**		**Study Zone**
505	AOC	Creosote Cross-Tie/Ballast Storage Area	Creosote Degradation Products	RFI	Area of Building	1803	A
506	AOC	Building 1629, Flammable Storage Shelter	Ignitable Materials	CSI	North of Building	1603	A
507	AOC	Former Building 1010, Oil Storehouse	Petroleum Products	CSI	Golf Course Area	1410	B

APPENDIX B

SWMU 1

CERTIFICATION OF HEALTH-BASED RISK CLEAN CLOSURE

CERTIFICATION OF CLEAN CLOSURE
DEFENSE REUTILIZATION AND MARKETING OFFICE STORAGE SHED
NAVAL SHIPYARD, CHARLESTON, SC

I. BACKGROUND

Since 1980 [when the Resource Conservation and Recovery Act (RCRA) was implemented], the Defense Reutilization and Marketing Office (DRMO) stored property that had become hazardous waste at the rear of Building 1617, a covered storage shed. In November, 1993, the South Carolina Department of Health and Environmental Control (SCDHEC) approved the November, 1992 revision of Closure Plans, Interim Status Facilities, Naval Shipyard Charleston (CNSYD), December, 1984.

II. CLOSURE DOCUMENTATION

To account for the peculiar circumstances that exist at CNSYD, the soil contamination assessment element at the DRMO Storage Shed departed from conventional approaches. Those circumstances, and their facility closure implications were reported to SCDHEC in Progress Report, Interim Status Facility Closures, Naval Shipyard, Charleston; May 1989. That report disclosed the discovery that the sandy soil underlying the DRMO Storage Shed is fill material. That heterogeneous material prohibited the collection of "background" samples typical of naturally occurring soils in the vicinity of the unit. That report contained a proposal for assessing soil contamination through the development of health based action levels in lieu of strict comparisons to nonrepresentative "background" constituent concentrations.

The proposed alternative was implemented and its results were reported in Risk Assessment and Development of Health-based Soil Clean-up Goals for Charleston Navy Shipyard, November 22, 1991. The assessment relied on analytical results from soil samples collected since October 1987 at the DRMO Storage Shed. The assessment report concluded, "Since the 95th percentile upper confidence limit of the average concentrations never exceeds the soil clean-up goal for any compound detected at the [DRMO Storage Shed], it is unlikely that these clean-up goals need to be applied at these locations."

Following the review of the November 1991 report by SCDHEC, the November 1992 final revision to the Closure Plan was submitted to the agency by Southern Division, Naval Facilities Engineering Command, on behalf of the CNSYD. That Closure Plan reflected the implementation of health-based clean-up goals at the DRMO Storage Shed.

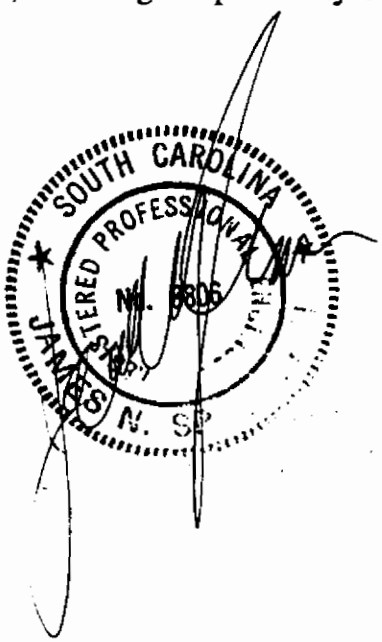
III. FINAL CLOSURE INSPECTION

On October 5, 1987, an EnSafe SC-registered professional engineer inspected the facility. No containers of hazardous wastes were present, and the area surrounding the hazardous waste storage racks was free of debris.

On January 4, 1994, the site of the DRMO storage shed was reinspected by EnSafe's SC-registered professional engineer. Since no soil decontamination is necessary using the health-based goals outlined in the SCDHEC-approved Closure Plan, the inspection focused on confirmation of the absence of any hazardous waste management activities at the site.

IV. CLOSURE CERTIFICATION

I am registered to practice engineering by the South Carolina State Board of Engineering Examiners (License number 8806). I certify, under penalty of law, that preparation of documentation and witnessing of the closure of the DRMO Storage Shed at CNSYD, SC was performed under my direction and supervision in accordance with a system design to assure that qualified personnel observe and evaluate closure activities. To the best of my knowledge and belief, the closure of the DRMO Storage Shed was performed in accordance with the SCDHEC-approved Closure Plan. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.



Date: January 11, 1994

CERTIFICATION OF CLEAN CLOSURE
DEFENSE REUTILIZATION AND
MARKETING OFFICE STORAGE SHED
NAVAL SHIPYARD CHARLESTON, SC

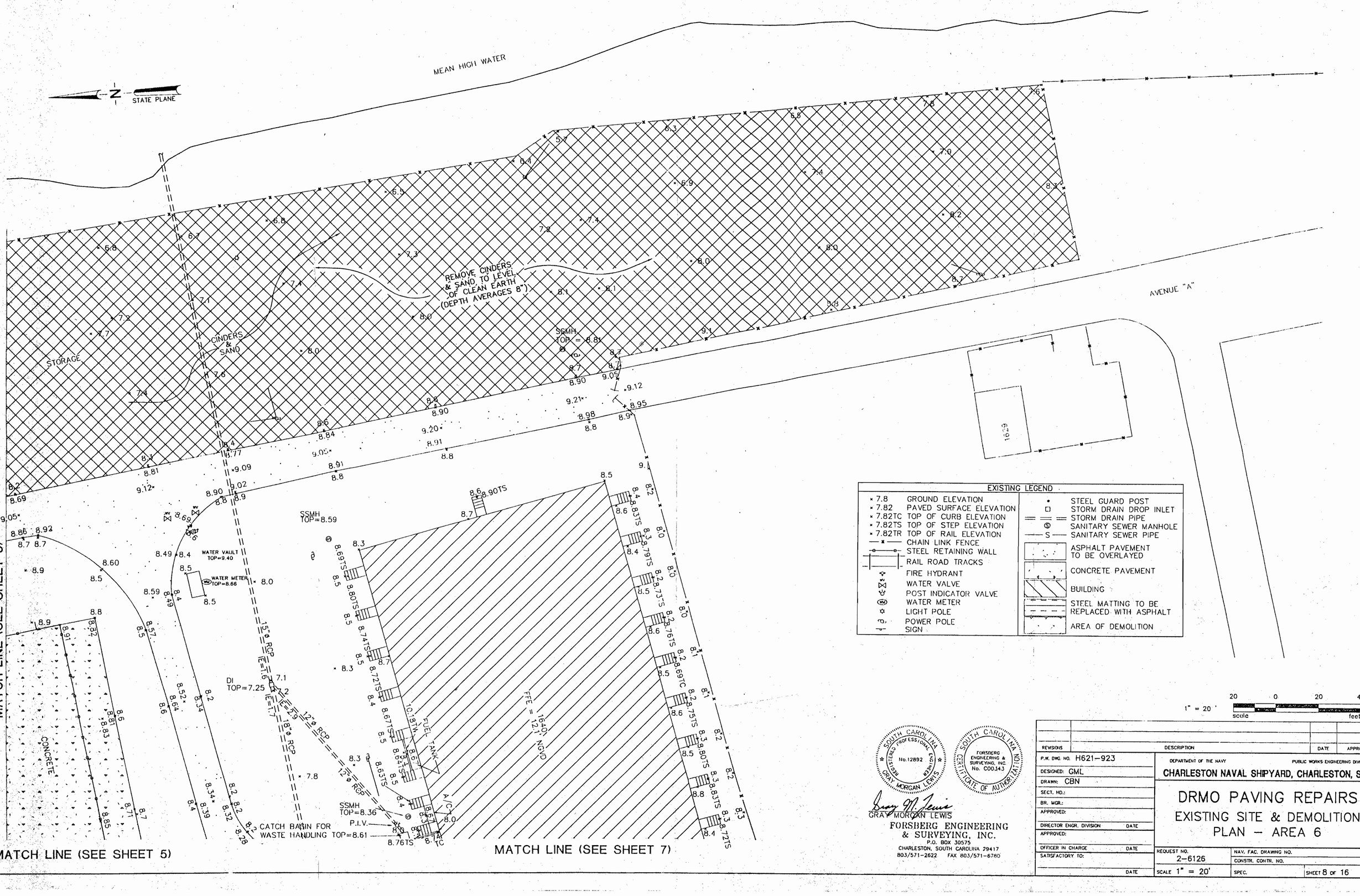
I certify, under penalty of law, that the attached document and all attachments were prepared under a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who managed the closure of the DRMO Storage Shed at Naval Shipyard Charleston, SC, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Date: 1/14/94

T. J. Porter, Captain, USN
Commander, Naval Shipyard Charleston

APPENDIX C

TOPOGRAPHIC DATA — SWMU 2



EXISTING LEGEND	
× 7.8 GROUND ELEVATION	• STEEL GUARD POST
× 7.82 PAVED SURFACE ELEVATION	□ STORM DRAIN DROP INLET
× 7.82TC TOP OF CURB ELEVATION	STORM DRAIN PIPE
× 7.82TS TOP OF STEP ELEVATION	Ⓢ SANITARY SEWER MANHOLE
× 7.82TR TOP OF RAIL ELEVATION	—S— SANITARY SEWER PIPE
—×— CHAIN LINK FENCE	ASPHALT PAVEMENT TO BE OVERLAYED
STEEL RETAINING WALL	CONCRETE PAVEMENT
RAIL ROAD TRACKS	BUILDING
FIRE HYDRANT	STEEL MATTING TO BE REPLACED WITH ASPHALT
WATER VALVE	AREA OF DEMOLITION
POST INDICATOR VALVE	
WATER METER	
LIGHT POLE	
POWER POLE	
SIGN	

1" = 20' scale 20 0 20 40 feet

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No.12892 GRAY MORGAN LEWIS

SOUTH CAROLINA FORSBERG ENGINEERING & SURVEYING, INC No. C00343 CERTIFICATE OF AUTHORIZATION

Gray M. Lewis
GRAY MORGAN LEWIS
FORSBERG ENGINEERING & SURVEYING, INC.
P.O. BOX 30575
CHARLESTON, SOUTH CAROLINA 29417
803/571-2622 FAX 803/571-6780

REVISIONS	DESCRIPTION	DATE	APPROVAL

P.W. DWG. NO. H621-923	DEPARTMENT OF THE NAVY — PUBLIC WORKS ENGINEERING DIVISION
DESIGNED: GML	CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.
DRAWN: CBN	DRMO PAVING REPAIRS
SECT. HD.:	EXISTING SITE & DEMOLITION PLAN — AREA 6
BR. MGR.:	
APPROVED:	
DIRECTOR ENGR. DIVISION DATE	
APPROVED:	
OFFICER IN CHARGE DATE	
SATISFACTORY TO:	
DATE	
REQUEST NO. 2-6126	NAV. FAC. DRAWING NO.
SCALE 1" = 20'	CONSTR. CONTR. NO.
SPEC.	SHEET 8 OF 16

MATCH LINE (SEE SHEET 4)

MATCH LINE (SEE SHEET 5)

MATCH LINE (SEE SHEET 6)

MATCH LINE (SEE SHEET 8)

N
STATE PLANE

DEMOLISH EXISTING ASPHALT PAVEMENT (APPROX. 3" THICK)

EXISTING RAILROAD TRACKAGE TO REMAIN

6"ø METAL IE=4.3

DI TOP=6.50

15"ø RCP

CONCRETE RAMP

DI TOP = 6.69

DI TOP = 6.21

12"ø CMP IE=3.8

DI TOP=8.25

ASPHALT

1608A EXISTING SLAB ONLY

1608B EXISTING SLAB ONLY

DEMOLISH EXISTING ASPHALT PAVEMENT (APPROX. 3" THICK)

ROC

MISC. STORAGE

1640 FFE = 12.1' NGVD

18"ø RCP IE=2.1

15"ø RCP IE=2.3

DI TOP=7.56

EXISTING LEGEND

×7.8 GROUND ELEVATION	• STEEL GUARD POST
×7.82 PAVED SURFACE ELEVATION	☐ STORM DRAIN DROP INLET
×7.82TC TOP OF CURB ELEVATION	STORM DRAIN PIPE
×7.82TS TOP OF STEP ELEVATION	Ⓢ SANITARY SEWER MANHOLE
×7.82TR TOP OF RAIL ELEVATION	S SANITARY SEWER PIPE
CHAIN LINK FENCE	ASPHALT PAVEMENT TO BE OVERLAYED
STEEL RETAINING WALL	CONCRETE PAVEMENT
RAIL ROAD TRACKS	BUILDING
FIRE HYDRANT	STEEL MATTING TO BE REPLACED WITH ASPHALT
WATER VALVE	AREA OF DEMOLITION
POST INDICATOR VALVE	
WATER METER	
LIGHT POLE	
POWER POLE	
SIGN	

1" = 20' scale 20 0 20 40 feet

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REVISIONS	DESCRIPTION	DATE	APPROVAL

P.W. DWG NO. H621-922
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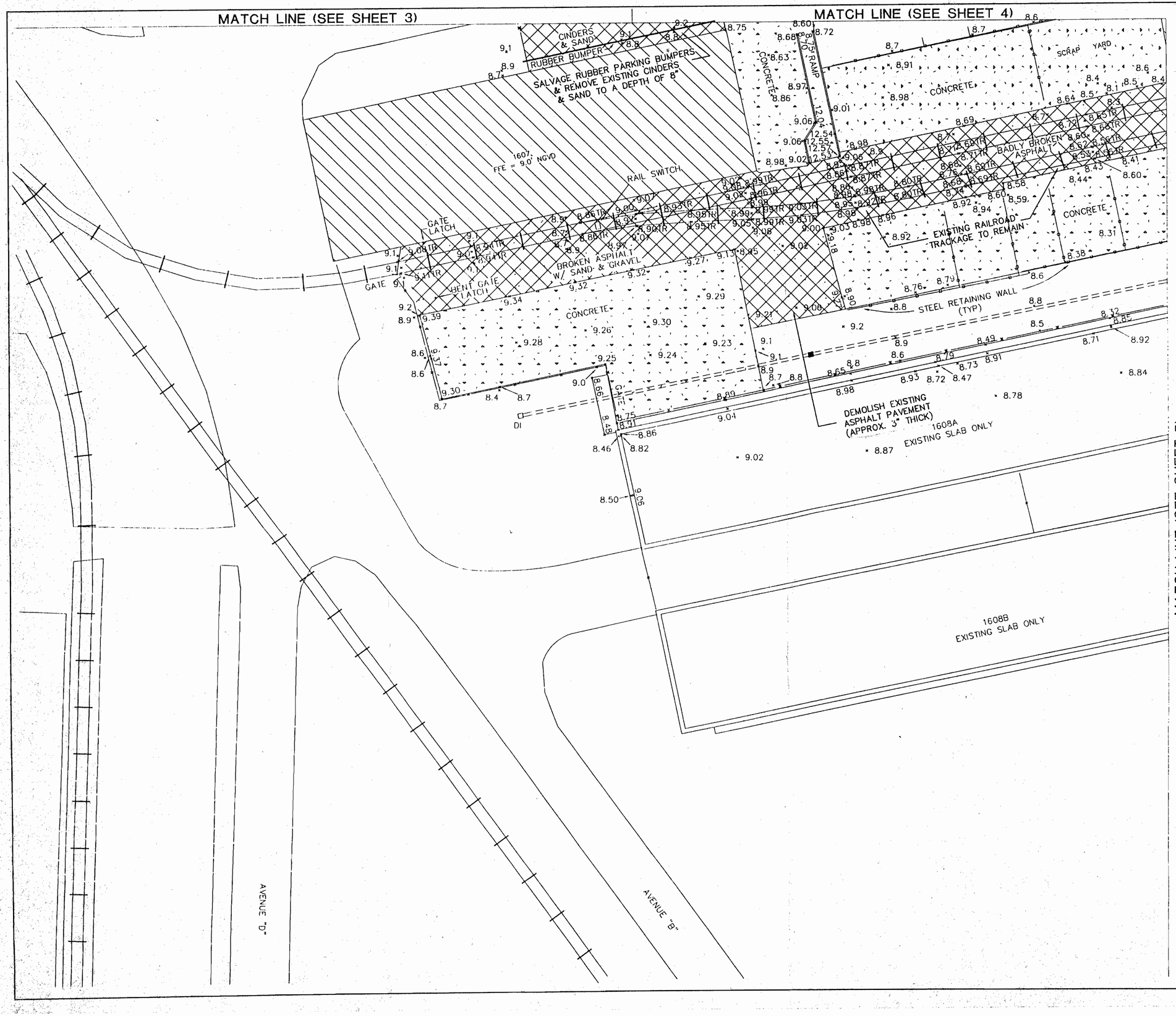
BR. MGR.:
APPROVED:
DIRECTOR ENGR. DIVISION DATE
APPROVED:
OFFICER IN CHARGE DATE
SATISFACTORY TO:
DATE

DEPARTMENT OF THE NAVY — PUBLIC WORKS ENGINEERING DIVISION
CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.

DRMO PAVING REPAIRS
EXISTING SITE & DEMOLITION PLAN – AREA 5

REQUEST NO. 2-6126
NAV. FAC. DRAWING NO.
CONSTR. CONTR. NO.
SCALE 1' = 20'
SPEC.
SHEET 7 OF 16



EXISTING LEGEND			
× 7.8	GROUND ELEVATION	•	STEEL GUARD POST
× 7.82	PAVED SURFACE ELEVATION	□	STORM DRAIN DROP INLET
× 7.82TC	TOP OF CURB ELEVATION		STORM DRAIN PIPE
× 7.82TS	TOP OF STEP ELEVATION	Ⓢ	SANITARY SEWER MANHOLE
× 7.82TR	TOP OF RAIL ELEVATION	—S—	SANITARY SEWER PIPE
—x—	CHAIN LINK FENCE		ASPHALT PAVEMENT TO BE OVERLAYED
	STEEL RETAINING WALL		CONCRETE PAVEMENT
	RAIL ROAD TRACKS		BUILDING
	FIRE HYDRANT		STEEL MATTING TO BE REPLACED WITH ASPHALT
	WATER VALVE		AREA OF DEMOLITION
	POST INDICATOR VALVE		
W	WATER METER		
	LIGHT POLE		
	POWER POLE		
	SIGN		

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SATISFACTORY TO:

DATE

DEPARTMENT OF THE NAVY PUBLIC WORKS ENGINEERING DIVISION

CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.

DRMO PAVING REPAIRS
EXISTING SITE & DEMOLITION PLAN – AREA 4

REQUEST NO. 2-6126

NAV. FAC. DRAWING NO.

CONSTR. CONTR. NO.

SCALE 1" = 20'

SPEC.

SHEET 6 OF 16

EXISTING 6" WALL CURB

DEMOLISH EXISTING ASPHALT PAVEMENT (APPROX. 3" THICK)

ROCK

CONCRETE SLAB TOP=8.96

CONCRETE SLAB TOP=8.80

SAW CUT EXISTING ASPHALT APPROXIMATELY 3" THICK

SAW CUT & REMOVE EXISTING ASPHALT (APPROX. 3" THICK)

STEEL MATTING (TO BE REMOVED BY OWNERS)

DEMOLISH EXISTING ASPHALT PAVEMENT (APPROX. 3" THICK)

WEIGH SCALES (CONCRETE)

ACCESS MANHOLE

DEMOLISH EXISITNG 12"ø RCP

SSMH TOP=7.99

CONCRETE STRUCTURE WITH GRATE TOP=8.30

DEMOLISH TOP 3' OF STRUCTURE, FILL REMAINDER WITH COMPACTED CRUSHED STONE AND CAP WITH 8" THICK CONCRETE SLAB, AND BACKFILL TO EXISTING GRADE

SAW CUT EXISTING ASPHALT (APPROX. 3" THICK)

DEMOLISH EXISTING ASPHALT PAVEMENT (APPROX. 3" THICK)

WOODEN STEP

DOOR

ASPHALT

1606 FFE = 9.0' NGVD

SALVAGE EXISTING WHEEL STOPS

CINDERS & SAND

SAW CUT & REMOVE EXISTING ASPHALT (APPROX. 3" THICK)

15"ø RCP

18"ø RCP

DI TOP=8.24

DI TOP=8.49

DI TOP=8.29

DI TOP=8.01

C.O.

TEL. PEDESTAL TOP = 9.02

SIXTH ST. NORTH

RADIO ANTENNA

OVERLAY CONCRETE SIDEWALK

SIGN

VCP

6"ø VCP IE=6.1

DI TOP=7.81

STRIP DRAIN GRATE

SIGNS

REMOVE CINDER/SAND FROM SURFACE DOWN TO CLEAN EARTH (DEPTH AVERAGES 8")

1649 FFE = 9.4' NGVD

WATER SPIGOT 8" PVC (VERTICAL)

SHED

CONCRETE

DEMOLISH EXISTING ASPHALT PAVEMENT (APPROX. 3" THICK)

EXISTING RAILROAD TRACKAGE TO REMAIN

RAIL SWITCH

STORAGE

MATCH LINE (SEE SHEET 4)

MATCH LINE (SEE SHEET 7)

MATCH LINE (SEE SHEET 8)

SEE SHEET 4 OF 16 FOR LEGEND

N STATE PLANE

1" = 20' scale

20 0 20 40 feet

REVISIONS	DESCRIPTION	DATE	APPROVAL

P.W. DWG. NO. H621-920

DESIGNED: GML

DRAWN: CBN

SECT. HD.:

BR. MGR.:

APPROVED:

DIRECTOR ENGR. DIVISION DATE

APPROVED:

OFFICER IN CHARGE DATE

SATISFACTORY TO:

DATE

DEPARTMENT OF THE NAVY — PUBLIC WORKS ENGINEERING DIVISION

CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.

DRMO PAVING REPAIRS

EXISTING SITE & DEMOLITION PLAN – AREA 3

REQUEST NO. 2-6126

NAV. FAC. DRAWING NO.

CONSTR. CONTR. NO.

SCALE 1" = 20'

SPEC.

SHEET 5 OF 16

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No. 12892 GRAY MORGAN LEWIS

SOUTH CAROLINA FORSBERG ENGINEERING & SURVEYING, INC. No. COA343 CERTIFICATE OF AUTHORIZATION

GRAY MORGAN LEWIS

FORSBERG ENGINEERING & SURVEYING, INC.

P.O. BOX 30575

CHARLESTON, SOUTH CAROLINA 29417

803/571-2622 FAX 803/571-6780

MATCH LINE (SEE SHEET 3)

MATCH LINE (SEE SHEET 5)

EXISTING CONCRETE SWALE

EXISTING 6" WALL CURB

EXISTING 6" WALL CURB

DI TOP=6.25

CURB OPENINGS FOR DRAINAGE FLOW

DEMOLISH EXISTING DROP INLET AND 6"ø VCP

DEMOLISH EXISTING DROP INLET AND 6"ø VCP

DI TOP=5.01

DEMOLISH EXISTING 12"ø RCP

6"ø VCP

6"ø VCP

ROC

MISC. STORAGE

15"ø RCP

15"ø RCP

15"ø RCP

IE=4.8

IE=4.3

IE=4.3

DI TOP=8.10

15"ø RCP

IE=2.9

IE=2.7

15"ø RCP

IE=2.9

DI TOP=7.22

IE=6.81

12"øRCP

SSMH TOP=8.13

IE=7.45

DEMOLISH EXISTING ASPHALT

SAWCUT EXISTING PAVEMENT (APPROXIMATELY 3" THICK)

STEEL PLATE (TO BE REMOVED BY OWNER)

CUT OFF FENCE POSTS

DEMOLISH EXISTING ASPHALT PAVEMENT

EXISTING RAILROAD TRACKAGE TO REMAIN

CUT OFF FENCE POST

CUT OFF FENCE POSTS

DIRT / ROCK

SSMH TOP=8.09

CONC. RAMP

DOOR

DOOR

ASPHALT

CONCRETE

SALVAGE EXISTING WHEEL STOPS

GATE

CONCRETE LOADING DOCK

FFE = 12.4' NGVD

1605

GAS TANK

CONCRETE SLAB

LATCH PIN SOCKET

GATE LATCH

GATE

GATE LATCH

WHEEL STOPS (SALVAGE)

STOP SIGN

WHEEL STOPS (SALVAGE)

DOOR

CONCRETE

DI TOP=8.03 IE=6.7 6"ø VCP

ROCK

ASPHALT RAMP

ASPHALT

TRAFFIC SIGN

IE=3.9

15"ø RCP

DI TOP=7.61

STEEL RETAINING WALL (TYP)

SALVAGE EXISTING WHEEL STOPS

DIRT

DEMOLISH EXISTING ASPHALT EXISTING RAILROAD TRACKAGE TO REMAIN

SCRAP YARD

CINDERS & SAND

CUT OFF FENCE POSTS

DI TOP=8.53 IE=5.9

15"ø RCP

FFE = 9.1' NGVD

1627

MATCH LINE (SEE SHEET 6)

MATCH LINE (SEE SHEET 7)

N

STATE PLANE

EXISTING LEGEND

7.8	GROUND ELEVATION
7.82	PAVED SURFACE ELEVATION
7.82TC	TOP OF CURB ELEVATION
7.82TS	TOP OF STEP ELEVATION
7.82TR	TOP OF RAIL ELEVATION
—x—	CHAIN LINK FENCE
	STEEL RETAINING WALL
	RAIL ROAD TRACKS
	FIRE HYDRANT
	WATER VALVE
	POST INDICATOR VALVE
W	WATER METER
	LIGHT POLE
	POWER POLE
	SIGN
	STEEL GUARD POST
	STORM DRAIN DROP INLET
	STORM DRAIN PIPE
S	SANITARY SEWER MANHOLE
S	SANITARY SEWER PIPE
	ASPHALT PAVEMENT TO BE OVERLAYED
	CONCRETE PAVEMENT
	BUILDING
	STEEL MATTING TO BE REPLACED WITH ASPHALT
	AREA OF DEMOLITION

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No.12892 GRAY MORGAN LEWIS

SOUTH CAROLINA FORSBERG ENGINEERING & SURVEYING, INC. No. C00343 CERTIFICATE OF AUTHORIZATION

GRAY MORGAN LEWIS

FORSBERG ENGINEERING & SURVEYING, INC.
P.O. BOX 30575
CHARLESTON, SOUTH CAROLINA 29417
803/571-2622 FAX 803/571-6780

1" = 20'

20 0 20 40
scale feet

REVISIONS	DESCRIPTION	DATE	APPROVAL

P.W. DWG. NO. H621-919
DESIGNED: GML
DRAWN: CBN
SECT. HD.:
BR. MGR.:
APPROVED:
DIRECTOR ENGR. DIVISION DATE
APPROVED:
OFFICER IN CHARGE DATE
SATISFACTORY TO:
DATE

DEPARTMENT OF THE NAVY PUBLIC WORKS ENGINEERING DIVISION
CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.

DRMO PAVING REPAIRS

EXISTING SITE & DEMOLITION PLAN – AREA 2

REQUEST NO. 2-6126	NAV. FAC. DRAWING NO.
SCALE 1" = 20'	CONSTR. CONTR. NO.
	SPEC.
	SHEET 4 OF 16

EXISTING FENCE IS LIMIT OF CONSTRUCTION

EXISTING CONCRETE SWALE

GW

DIRT

STORAGE

ROCK

BURIED FOOTING

EXPOSED FOOTING

EXISTING CONCRETE CURB

ASPHALT CURB

DROP INLET

EXISTING FENCE IS LIMIT OF CONSTRUCTION

END OF CURB IS BURIED AND RUNS UNDER FENCE

1905

1604

1605
FFE = 12.4' NGVD

LIMESTONE & SHELL

REMOVE EXISTING CINDERS & SAND TO DEPTH OF 8"

GATE

CINDERS & SAND

MATCH LINE (SEE SHEET 6)

MATCH LINE (SEE SHEET 4)

N
STATE PLANE

EXISTING LEGEND

× 7.8 GROUND ELEVATION	• STEEL GUARD POST
× 7.82 PAVED SURFACE ELEVATION	STORM DRAIN DROP INLET
× 7.82TC TOP OF CURB ELEVATION	STORM DRAIN PIPE
× 7.82TS TOP OF STEP ELEVATION	SANITARY SEWER MANHOLE
× 7.82TR TOP OF RAIL ELEVATION	S SANITARY SEWER PIPE
CHAIN LINK FENCE	ASPHALT PAVEMENT TO BE OVERLAYED
STEEL RETAINING WALL	CONCRETE PAVEMENT
RAIL ROAD TRACKS	BUILDING
FIRE HYDRANT	STEEL MATTING TO BE REPLACED WITH ASPHALT
WATER VALVE	AREA OF DEMOLITION
POST INDICATOR VALVE	
WATER METER	
LIGHT POLE	
POWER POLE	
SIGN	

SOUTH CAROLINA REGISTERED PROFESSIONAL ENGINEER No.12892 GRAY MORGAN LEWIS

SOUTH CAROLINA FORSBERG ENGINEERING & SURVEYING, INC. No. C00343 CERTIFICATE OF AUTHORIZATION

Gray M. Lewis
GRAY MORGAN LEWIS

FORSBERG ENGINEERING & SURVEYING, INC.
P.O. BOX 30575
CHARLESTON, SOUTH CAROLINA 29417
803/571-2622 FAX 803/571-6780

1" = 20' scale 20 0 20 40 feet

REVISIONS	DESCRIPTION	DATE	APPROVAL

P.W. DWG. NO. H621-918
DESIGNED: GML
DRAWN: CBN
SECT. HD.:
BR. MGR.:
APPROVED:
DIRECTOR ENGR. DIVISION DATE
APPROVED:
OFFICER IN CHARGE DATE
SATISFACTORY TO:
DATE

DEPARTMENT OF THE NAVY PUBLIC WORKS ENGINEERING DIVISION
CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.

DRMO PAVING REPAIRS
EXISTING SITE & DEMOLITION PLAN – AREA 1

REQUEST NO. 2-6126
NAV. FAC. DRAWING NO.
CONSTR. CONTR. NO.
SCALE 1" = 20'
SPEC.
SHEET 3 OF 16

APPENDIX D

PREVIOUS INVESTIGATIONS

TABLE D-1A
Lead Concentrations in Soils in the DRMO Area

Sample Location	Depth	Lead Conc. (mg/kg)	Sample Location	Depth (feet)	Lead Conc. (mg/kg)
SS-1	Surficial	69.2	B1-S	Surf.-0.5	4,040
SS-2	Surficial	2.72	B1-1	3-4.5	3.85
SS-3	Surficial	<1.3	B1-2	6-7.5	1.3
SS-4	Surficial	28.5	B1-3	8.5-10	2.63
SS-5	Surficial	137	B2-S	Surf.-0.5	5,000
SS-6	Surficial	<1.3	B2-1	3-4.5	101
SS-7	Surficial	20.7	B2-2	6-7.5	2.13
SS-8	Surficial	6.7	B2-3	8.5-10	6.98
SS-9	Surficial	8.17	B3-S	Surf.-0.5	5,600
SS-10	Surficial	68.7	B3-1	3-4.5	64.2
SS-11	Surficial	126	B3-2	6-7.5	24.4
SS-12	Surficial	<1.3	B3-3	8.5-10	17.5
SS-13	Surficial	<1.3	B4-S	Surf.-0.5	48,600
SS-14	Surficial	43	B4-1	3-4.5	1,310
SS-15	Surficial	371	B4-2	6-7.5	411
SS-16	Surficial	286	B4-3	8.5-10	2,480
SS-17	Surficial	266	B5-S	Surf.-0.5	39,200
SS-18	Surficial	424	B5-1	3-4.5	49
SS-19	Surficial	<1.3	B5-2	6-7.5	34.1
SS-20	Surficial	40.4	B6-S	Surf.-0.5	6,430
SS-21	Surficial	54	B6-1	3-4.5	14.2
SS-22	Surficial	328	B6-2	6-7.5	346
SS-23	Surficial	717	B7-S	Surf.-0.5	29,500
SS-24	Surficial	488	B7-1	3-4.5	536
SS-25	Surficial	32.7	B7-2	6-7.5	1,090
SS-26	Surficial	371,000	B8-S	Surf.-0.5	2,780
SS-27	Surficial	10,500	B8-1	3-4.5	174
SS-28	Surficial	107,000	B8-2	6-7.5	<1.3
SS-29	Surficial	1,260	B9-S	Surf.-0.5	3,820
SS-30	Surficial	9,320	B9-1	3-4.5	42.9
SS-31	Surficial	2,810	B9-2	6-7.5	11.3
SS-32	Surficial	907	B9-3	8.5-10	39.7
SS-33	Surficial	298	B10-S	Surf.-0.5	518
SS-34	Surficial	533	B10-1	3-4.5	48.1
SS-35	Surficial	411	B10-2	6-7.5	3.95
			B10-3	8.5-10	1.62

TABLE D-1B
Lead Concentrations in Indoor and Outdoor Ambient Air in the DRMO Area

Sample Matrix	Sample Number	Lead Concentration (micrograms per cubic meter)
Outside-Air	HVD1-1	<1
Outside-Air	HVD1-2	<1
Outside-Air	HVD2-1	2
Outside-Air	HVD2-2	1
Building-Air	AA1606 (office)	<20
Building-Air	AA1606 (warehouse)	<20
Building-Air	AA1607	<20
Building-Air	AA1608A	<20
Building-Air	AA1612	<20
Building-Air	AA1613	<20
Building-Air	AA1627	<20
Building-Air	AA2521	<20

Table D-2
Lead Concentrations in Soil
Preliminary RFI Sampling
SWMUs 1 and 2
Fall 1993

Boring Number	Lead Concentration (mg/kg)	Boring Number	Lead
S01-B01-01	7.1	S02-B13-01	79
S01-B01-02	**5.4**	**S02-B13-02**	**3.7**
S01-B02-01	228	S02-B14-01	29
S01-B02-02	**10.4**	**S02-B14-02**	
S02-B01-01	160	S02-B15-01	1400
S02-B01-02	**2.3**	**S02-B15-02**	
S02-B02-01	31	S02-B16-01	1100
S02-B02-02	**3**	**S02-B16-02**	**29**
S02-B03-01	17	S02-B17-01	14
S02-B03-02	**34**	**S02-B17-02**	**2.8**
S02-B04-01		S02-B18-01	8.5
S02-B04-02	**34**	**S02-B18-02**	**3.7**
S02-B05-01	14	S02-B19-01	14
S02-B05-02	**8.6**	**S02-B19-02**	**4.9**
S02-B06-01	44	S02-B20-01	8.6
S02-B06-02	**40**	**S02-B20-02**	**5.6**
S02-B07-01	310	S02-B21-01	480
S02-B07-02	**23**	**S02-B21-02**	**5.9**
S02-B08-01	39	S02-B22-01	28
S02-B08-02	**3.5**	**S02-B22-02**	**4.6**
S02-B09-01	570	S02-B23-01	1
S02-B09-02	**12**	**S02-B23-02**	**1.4**
S02-B10-01	40		
S02-B10-02	**18**		
S02-B11-01	1600		
S02-B11-02	**20**		
S02-B12-01	160		
S02-B12-02	**9**		

Table D-2 Lead Concentrations in Sediment and Groundwater Preliminary RFI Sampling SWMUs 1 and 2 Fall 1993	
Sediment Sample Number	**Lead Conc. Mg/Kg**
S02-S01-01[1]	1000
S02-S02-01[1]	200
S02-S03-01[1]	110
S02-S04-01[1]	86
S02-S05-01	3.7
S02-S06-01	14
S02-S07-01	47
S02-S08-01	6.4
S02-S09-01	26.9
S02-S10-01	7.9
S02-S11-01	17

Note:

[1] Sediment sample collected from storm sewer system

Table D-2 Lead Concentrations in Sediment and Groundwater Preliminary RFI Sampling SWMUs 1 and 2 Fall 1993				
Monitoring Well Number	**Sample**	**Lead (µg/L)**	**Arsenic (µg/L)**	**Beryllium µg(L)**
CNSY-02-01	S02-W01-01	<5	<10	<5
CNSY-02-02	S01-W02-01	<5	<10	<5
CNSY-02-03	S01-W03-01	<5	<10	<5
CNSY-02-04	S01-W04-01	<5	<10	<5
CNSY-02-05	S01-W05-01	910	89[2]	9.4[2]
CNSY-02-06	S01-W06-01	<5	<10	<5

Note:

[2] Beryllium and Arsenic were not detected above their respective soil, RBCs in the shallow subsurface soils at this location.

APPENDIX E

LABORATORY ANALYTICAL PACKAGE — SWMUs 1 AND 2

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: S3-46479

Received: 16 NOV 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS22/25)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
46479-3	CNSY/S02-W04-01	11-15-93/1145	CNS25
46479-4	CNSY/S02-W03-01	11-15-93/1107	CNS25
46479-5	CNSY/S02-W05-01	11-15-93/1250	CNS25
46479-6	CNSY/S02-W01-01	11-15-93/1452	CNS25
46479-7	CNSY/S02-W06-01	11-15-93/1532	CNS25

PARAMETER	46479-3	46479-4	46479-5	46479-6	46479-7
Aluminum (6010)					
Aluminum (6010) , ug/l	200U	200U	440000	200U	200U
Date Analyzed	12.03.93	11.30.93	12.02.93	12.02.93	11.30.93
Antimony (6010)					
Antimony (6010) , ug/l	50U	50U	50U	50U	50U
Date Analyzed	12.02.93	12.02.93	12.02.93	12.02.93	11.30.93
Arsenic (7060)					
Arsenic (7060), ug/l	10U	10U	89	10U	10U
Date Analyzed	12.03.93	12.03.93	12.03.93	12.03.93	11.22.93
Barium (6010)					
Barium (6010), ug/l	42	41	1300	10U	110
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	12.01.93
Beryllium					
Beryllium (6010), ug/l	5.0U	5.0U	9.4	5.0U	5.0U
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Cadmium (6010)					
Cadmium (6010), ug/l	5.0U	5.0U	5.0U	5.0U	5.0U
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Calcium (6010)					
Calcium (6010), ug/l	10000	65000	130000	18000	92000
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

5102 LaRocne Avenue • Savannan, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: S3-46479

Received: 16 NOV 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
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Purchase Order: 041100/93

Project: CTO-029 (SDG CNS22/25)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
46479-3	CNSY/S02-W04-01	11-15-93/1145	CNS25
46479-4	CNSY/S02-W03-01	11-15-93/1107	CNS25
46479-5	CNSY/S02-W05-01	11-15-93/1250	CNS25
46479-6	CNSY/S02-W01-01	11-15-93/1452	CNS25
46479-7	CNSY/S02-W06-01	11-15-93/1532	CNS25

PARAMETER	46479-3	46479-4	46479-5	46479-6	46479-7
Chromium (6010)					
Chromium (6010), ug/l	10U	10U	630	10U	10U
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Cobalt (6010)					
Cobalt (6010), ug/l	10U	10U	40	10U	10U
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Copper (6010)					
Copper (6010), ug/l	25U	25U	160	25U	25U
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	12.01.93
Iron (6010)					
Iron (6010), ug/l	7100	720	180000	1100	3200
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Lead (7421)					
Lead (7421), ug/l	5.0U	5.0U	910X	5.0U	5.0U
Date Analyzed	12.01.93	12.01.93	12.02.93	12.02.93	11.29.93
Magnesium (6010)					
Magnesium (6010), ug/l	13000	34000	110000	2500	4500
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Manganese (6010)					
Manganese (6010), ug/l	150	320	510	51	160
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	12.01.93

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: S3-46479

Received: 16 NOV 93

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Purchase Order: 041100/93

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Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
46479-3	CNSY/S02-W04-01	11-15-93/1145	CNS25
46479-4	CNSY/S02-W03-01	11-15-93/1107	CNS25
46479-5	CNSY/S02-W05-01	11-15-93/1250	CNS25
46479-6	CNSY/S02-W01-01	11-15-93/1452	CNS25
46479-7	CNSY/S02-W06-01	11-15-93/1532	CNS25

PARAMETER	46479-3	46479-4	46479-5	46479-6	46479-7
Mercury					
Mercury (7470/7471), ug/l	0.20UN	0.20UN	0.46N	0.20UN	0.20UN
Date Analyzed	11.23.93	11.23.93	11.23.93	11.23.93	11.23.93
Nickel (6010)					
Nickel (6010), ug/l	40U	40U	110	40U	40U
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Potassium (6010)					
Potassium (6010), ug/l	19000	17000	87000	1200	3900
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Selenium (7740)					
Selenium (7740), ug/l	10U	10U	200UW	10U	10UW
Date Analyzed	12.03.93	12.03.93	12.03.93	12.03.93	11.22.93
Silver (6010)					
Silver (6010), ug/l	10U	10U	10U	10U	10U
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	12.02.93
Sodium (6010)					
Sodium (6010) , ug/l	340000	49000	970000	160000	6900
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Thallium (7841)					
Thallium (7841) , ug/l	50U	10U	100U	10U	10U
Date Analyzed	12.02.93	12.01.93	12.02.93	12.01.93	11.29.93

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

5102 LaRocne Avenue • Savannan, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: S3-46479

Received: 16 NOV 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS22/25)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	SDG#
46479-3	CNSY/S02-W04-01	11-15-93/1145	CNS25
46479-4	CNSY/S02-W03-01	11-15-93/1107	CNS25
46479-5	CNSY/S02-W05-01	11-15-93/1250	CNS25
46479-6	CNSY/S02-W01-01	11-15-93/1452	CNS25
46479-7	CNSY/S02-W06-01	11-15-93/1532	CNS25

PARAMETER	46479-3	46479-4	46479-5	46479-6	46479-7
Vanadium (6010)					
Vanadium (6010), ug/l	10U	10U	640	10U	10U
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Zinc (6010)					
Zinc (6010), ug/l	20U	21	520	20U	20U
Date Analyzed	12.03.93	12.02.93	12.02.93	12.02.93	11.30.93
Cyanide					
Cyanide, Total (9011/9012), ug/l	10UN	10UN	10UN	10UN	10UN
Date Analyzed	11.24.93	11.24.93	11.24.93	11.24.93	11.24.93

LOG NUMBER : S346479A*1
MATRIX : LI
DATE RECEIVED : 11/16/93
SAMPLE (WT/VOL) : N/A
GC COLUMN : CAP
DILUTION FACTOR : 1.0
BATCH ID : 1122B

SAMPLE DESCRIPTION : 1*CNSY/S02-W02-01
SDG#: CNS23

LEVEL : LOW
% MOISTURE : 0 %
LAB FILE ID : B7010
CLOCK ID : 2C1123B

DET NAME : Volatiles by GC/MS (8240)

CHEMICAL NAME	RESULT	UNITS
Chloromethane	10U	ug/l
Bromomethane	10U	ug/l
Vinyl Chloride	10U	ug/l
Chloroethane	10U	ug/l
Methylene Chloride (Dichloromethane)	5.0U	ug/l
Acetone	50U	ug/l
Carbon Disulfide	5.0U	ug/l
1,1-Dichloroethene	5.0U	ug/l
1,1-Dichloroethane	5.0U	ug/l
Trans-1,2-Dichloroethylene	5.0U	ug/l
Cis-1,2-Dichloroethene	5.0U	ug/l
Chloroform	5.0U	ug/l
1,2-Dichloroethane	5.0U	ug/l
2-Butanone (MEK)	50U	ug/l
1,1,1-Trichloroethane	5.0U	ug/l
Carbon Tetrachloride	5.0U	ug/l
Vinyl Acetate	10U	ug/l
Bromodichloromethane	5.0U	ug/l
1,1,2,2-Tetrachloroethane	5.0U	ug/l
1,2-Dichloropropane	5.0U	ug/l
Trans-1,3-Dichloropropene	5.0U	ug/l
Trichloroethene	5.0U	ug/l
Dibromochloromethane	5.0U	ug/l
1,1,2-Trichloroethane	5.0U	ug/l
Benzene	5.0U	ug/l
Cis-1,3-Dichloropropene	5.0U	ug/l
Bromoform	5.0U	ug/l
2-Hexanone	50U	ug/l
4-Methyl-2-pentanone (MIBK)	50U	ug/l
Tetrachloroethene	5.0U	ug/l
Toluene	5.0U	ug/l
Chlorobenzene	5.0U	ug/l
Ethylbenzene	5.0U	ug/l
Styrene	5.0U	ug/l
Xylenes	5.0U	ug/l
Surrogate - Toluene-d8 *	93 %	
Surrogate - 4-Bromofluorobenzene *	104 %	
Surrogate - 1,2-Dichloroethane-d4 *	113 %	
Date Analyzed *	11.24.93	

000017

LOG NUMBER : S346479A*1
MATRIX : LI
DATE RECEIVED : 11/16/93
SAMPLE (WT/VOL) : 1000mL
FINAL EXTRACT VOLUME : 1mL
GC COLUMN : N/A
DILUTION FACTOR : 1.0
BATCH ID : 1119A

SAMPLE DESCRIPTION : 1*CNSY/S02-W02-01
SDG#: CNS23

LEVEL : LOW
INJECTION VOLUME : 1uL
% MOISTURE : 100 %
LAB FILE ID : J3365
CLOCK ID :

DET NAME : Semivolatiles (8270)

CHEMICAL NAME	RESULT	UNITS
Phenol	10U	ug/l
bis(2-Chloroethyl)ether	10U	ug/l
2-Chlorophenol	10U	ug/l
1,3-Dichlorobenzene	10U	ug/l
1,4-Dichlorobenzene	10U	ug/l
1,2-Dichlorobenzene	10U	ug/l
2-Methylphenol (o-cresol)	10U	ug/l
Bis(2-chloroisopropyl)ether	10U	ug/l
3-Methylphenol/4-Methylphenol(m&p-cresol)	10U	ug/l
N-Nitroso-di-n-propylamine	10U	ug/l
Hexachloroethane	10U	ug/l
Nitrobenzene	10U	ug/l
Isophorone	10U	ug/l
2-Nitrophenol	10U	ug/l
2,4-Dimethylphenol	10U	ug/l
bis(2-Chloroethoxy)methane	10U	ug/l
2,4-Dichlorophenol	10U	ug/l
1,2,4-Trichlorobenzene	10U	ug/l
Naphthalene	10U	ug/l
4-Chloroaniline	20U	ug/l
Hexachlorobutadiene	10U	ug/l
4-Chloro-3-methylphenol	10U	ug/l
2-Methylnaphthalene	10U	ug/l
Hexachlorocyclopentadiene	10U	ug/l
2,4,6-Trichlorophenol	10U	ug/l
2,4,5-Trichlorophenol	10U	ug/l
2-Chloronaphthalene	10U	ug/l
2-Nitroaniline	50U	ug/l
Dimethylphthalate	10U	ug/l
Acenaphthylene	10U	ug/l
3-Nitroaniline	50U	ug/l
Acenaphthene	10U	ug/l
2,4-Dinitrophenol	50U	ug/l
4-Nitrophenol	50U	ug/l
Dibenzofuran	10U	ug/l
2,4-Dinitrotoluene	10U	ug/l
2,6-Dinitrotoluene	10U	ug/l
Diethylphthalate	10U	ug/l
4-Chlorophenyl-phenyl ether	10U	ug/l

LOG NUMBER : S346479A*1
MATRIX : LI
DATE RECEIVED : 11/16/93
SAMPLE (WT/VOL) : 1000mL
FINAL EXTRACT VOLUME : 1mL
GC COLUMN : N/A
DILUTION FACTOR : 1.0
BATCH ID : 1119A

SAMPLE DESCRIPTION : 1*CNSY/S02-W02-01
SDG#: CNS23

LEVEL : LOW
INJECTION VOLUME : 1uL
% MOISTURE : 100 %
LAB FILE ID : J3365
CLOCK ID :

DET NAME : Semivolatiles (8270)

CHEMICAL NAME	RESULT	UNITS
Fluorene	10U	ug/l
4-Nitroaniline	50U	ug/l
4,6-Dinitro-2-methylphenol	50U	ug/l
N-Nitrosodiphenylamine/Diphenylamine	10U	ug/l
4-Bromophenyl-phenyl-ether	10U	ug/l
Hexachlorobenzene	10U	ug/l
Pentachlorophenol	50U	ug/l
Phenanthrene	10U	ug/l
Anthracene	10U	ug/l
Di-n-butylphthalate	10U	ug/l
Fluoranthene	10U	ug/l
Pyrene	10U	ug/l
Butylbenzylphthalate	10U	ug/l
3,3'-Dichlorobenzidine	20U	ug/l
Benzo(a)anthracene	10U	ug/l
bis(2-Ethylhexyl)phthalate	10U	ug/l
Chrysene	10U	ug/l
Di-n-octylphthalate	10U	ug/l
Benzo(b)fluoranthene	10U	ug/l
Carbazole	10U	ug/l
Benzo(k)fluoranthene	10U	ug/l
Benzo(a)pyrene	10U	ug/l
Indeno(1,2,3-cd)pyrene	10U	ug/l
Dibenz(a,h)anthracene	10U	ug/l
Benzo(g,h,i)perylene	10U	ug/l
Surrogate - Phenol d 5 *	61 %	
Surrogate - 2-Fluorophenol *	58 %	
Surrogate - 2,4,6-Tribromophenol *	68 %	
Surrogate - Nitrobenzene d-5 *	59 %	
Surrogate - 2-Fluorobiphenyl *	63 %	
Surrogate - Terphenyl *	66 %	
Date Extracted	11.19.93	
Date Analyzed *	11.29.93	

LOG NUMBER : S346479A*1
MATRIX : LI
DATE RECEIVED : 11/16/93
SAMPLE (WT/VOL) : 1000ml
FINAL EXTRACT VOLUME : 10ml
GPC CLEANUP (Y/N) : NO
DILUTION FACTOR : 1.0
BATCH ID : 1118T

SAMPLE DESCRIPTION : 1*CNSY/S02-W02-01
SDG# : CNS23

LEVEL : LOW
INJECTION VOLUME : 2.0ul
% MOISTURE : ---
LAB FILE ID : N/A
CLOCK ID :

DET NAME : Pesticides (8080)

CHEMICAL NAME	RESULT	UNITS
alpha-BHC	0.050U	ug/l
beta-BHC	0.050U	ug/l
delta-BHC	0.050U	ug/l
gamma-BHC	0.050U	ug/l
Heptachlor	0.050U	ug/l
Aldrin	0.050U	ug/l
Heptachlor epoxide	0.050U	ug/l
Endosulfan I	0.050U	ug/l
Dieldrin	0.10U	ug/l
4,4'-DDE	0.10U	ug/l
Endrin	0.10U	ug/l
Endosulfan II	0.10U	ug/l
4,4'-DDD	0.10U	ug/l
Endosulfan sulfate	0.10U	ug/l
4,4'-DDT	0.10U	ug/l
Endrin ketone	0.10U	ug/l
Methoxychlor	0.50U	ug/l
alpha-Chlordane	0.050U	ug/l
gamma-Chlordane	0.050U	ug/l
Toxaphene	5.0U	ug/l
Aroclor-1016	1.0U	ug/l
Aroclor-1221	2.0U	ug/l
Aroclor-1232	1.0U	ug/l
Aroclor-1242	1.0U	ug/l
Aroclor-1248	1.0U	ug/l
Aroclor-1254	1.0U	ug/l
Aroclor-1260	1.0U	ug/l
Endrin Aldehyde	0.10U	ug/l
% R Surrogate-TCX *	81 %	
% R Surrogate-DBC *	123 %	
Date Extracted	11.18.93	
Date Analyzed *	12.23.93	

1

INORGANIC ANALYSES DATA SHEET

SL Sample No.: 647901

Lab Name: SAVANNAH_LABORATORIES

Lab Code: SLSAV

SDG No.: CNS023

Matrix (soil/water): WATER

Client Sample ID: W02-01

Date Received: 11/16/93

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	200	U		P
7440-36-0	Antimony	50.0	U		P
7440-38-2	Arsenic	10.0	U	W	F
7440-39-3	Barium	57.4			P
7440-41-7	Beryllium	5.0	U		P
7440-43-9	Cadmium	5.0	U	N	P
7440-70-2	Calcium	158000		E	P
7440-47-3	Chromium	10.0	U		P
7440-48-4	Cobalt	10.0	U		P
7440-50-8	Copper	25.0	U		P
7439-89-6	Iron	2950		E	P
7439-92-1	Lead	5.0	U	W	F
7439-95-4	Magnesium	88500			P
7439-96-5	Manganese	3370		E	P
7439-97-6	Mercury	0.20	U	N	CV
7440-02-0	Nickel	40.0	U		P
7440-09-7	Potassium	33600			P
7782-49-2	Selenium	10.0	U	WN	F
7440-22-4	Silver	10.0	U		P
7440-23-5	Sodium	520000			P
7440-28-0	Thallium	50.0	U	WN	F
7440-62-2	Vanadium	10.0	U		P
7440-66-6	Zinc	175			P
	Cyanide	10.0	U	N	AS

Comments:

FORM I - IN

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: S3-45997

Received: 26 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS15/CNS16)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45997-4	CNSY/S02-S01-01	10-25-93/1020	CNS16
45997-5	CNSY/S02-S02-01	10-25-93/1030	CNS16
45997-6	CNSY/S02-S03-01	10-25-93/1040	CNS16
45997-7	CNSY/S02-S04-01	10-25-93/1050	CNS16
45997-8	CNSY/S02-S05-01	10-25-93/1330	CNS16

PARAMETER	45997-4	45997-5	45997-6	45997-7	45997-8
Aluminum (6010)					
Aluminum (6010) , mg/kg dw	9100	4600	6600	1400	2600
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Antimony (6010)					
Antimony (6010) , mg/kg dw	9.7N	6.0UN	7.4UN	7.9UN	6.7UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Arsenic (7060)					
Arsenic (7060), mg/kg dw	17N	6.4N	18N	5.5N	5.1N
Date Analyzed	11.08.93	11.08.93	11.10.93	11.09.93	11.08.93
Barium (6010)					
Barium (6010), mg/kg dw	160N	18N	26N	25N	5.4N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Beryllium					
Beryllium (6010), mg/kg dw	2.2N	0.60UN	0.74UN	0.79N	0.67UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Cadmium (6010)					
Cadmium (6010), mg/kg dw	8.4N	1.7N	1.8N	1.3N	0.67UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Calcium (6010)					
Calcium (6010), mg/kg dw	84000	82000	150000	73000	690
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93

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& ENVIRONMENTAL SERVICES, INC.

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LOG NO: S3-45997

Received: 26 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS15/CNS16)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45997-4	CNSY/S02-S01-01	10-25-93/1020	CNS16
45997-5	CNSY/S02-S02-01	10-25-93/1030	CNS16
45997-6	CNSY/S02-S03-01	10-25-93/1040	CNS16
45997-7	CNSY/S02-S04-01	10-25-93/1050	CNS16
45997-8	CNSY/S02-S05-01	10-25-93/1330	CNS16

PARAMETER	45997-4	45997-5	45997-6	45997-7	45997-8
Chromium (6010)					
Chromium (6010), mg/kg dw	35	76	31	11	6.6
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Cobalt (6010)					
Cobalt (6010), mg/kg dw	3.1	3.5	2.9	1.6U	1.5
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Copper (6010)					
Copper (6010), mg/kg dw	230	290	92	29	3.3U
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Iron (6010)					
Iron (6010), mg/kg dw	13000	17000	7000	6900	3500
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Lead (7421)					
Lead (7421), mg/kg dw	1000X	200X	110X	86X	3.7
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.12.93
Magnesium (6010)					
Magnesium (6010), mg/kg dw	2400	3500	3000	880	650
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Manganese (6010)					
Manganese (6010), mg/kg dw	470	140	120	68	24
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93

SL SAVANNAH LABORATORIES
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LOG NO: S3-45997

Received: 26 OCT 93

Mr. Paul Stoddard
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Purchase Order: 041100/93

Project: CTO-029 (SDG CNS15/CNS16)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45997-4	CNSY/S02-S01-01	10-25-93/1020	CNS16
45997-5	CNSY/S02-S02-01	10-25-93/1030	CNS16
45997-6	CNSY/S02-S03-01	10-25-93/1040	CNS16
45997-7	CNSY/S02-S04-01	10-25-93/1050	CNS16
45997-8	CNSY/S02-S05-01	10-25-93/1330	CNS16

PARAMETER	45997-4	45997-5	45997-6	45997-7	45997-8
Mercury					
Mercury (7470/7471), mg/kg dw	0.39	0.56	0.10	0.11	0.013U
Date Analyzed	11.10.93	11.10.93	11.05.93	11.05.93	11.05.93
Nickel (6010)					
Nickel (6010), mg/kg dw	36N	54N	16N	9.8N	5.3UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Potassium (6010)					
Potassium (6010), mg/kg dw	1800N	270N	630N	160UN	390N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Selenium (7740)					
Selenium (7740), mg/kg dw	1.2UWN	1.2UWN	1.5UWN	1.6UWN	1.3UWN
Date Analyzed	11.06.93	11.06.93	11.06.93	11.06.93	11.06.93
Silver (6010)					
Silver (6010), mg/kg dw	11N	1.2UN	5.2N	1.6UN	1.3UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Sodium (6010)					
Sodium (6010) , mg/kg dw	290N	1100N	600N	110N	2300N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Thallium (7841)					
Thallium (7841) , mg/kg dw	1.2U	1.2UW	1.5UW	1.6U	1.3UW
Date Analyzed	11.15.93	11.15.93	11.15.93	11.15.93	11.15.93

SL SAVANNAH LABORATORIES
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LOG NO: S3-45997

Received: 26 OCT 93

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EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS15/CNS16)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45997-4	CNSY/S02-S01-01	10-25-93/1020	CNS16
45997-5	CNSY/S02-S02-01	10-25-93/1030	CNS16
45997-6	CNSY/S02-S03-01	10-25-93/1040	CNS16
45997-7	CNSY/S02-S04-01	10-25-93/1050	CNS16
45997-8	CNSY/S02-S05-01	10-25-93/1330	CNS16

PARAMETER	45997-4	45997-5	45997-6	45997-7	45997-8
Vanadium (6010)					
Vanadium (6010), mg/kg dw	17	16	21	6.8	10
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Zinc (6010)					
Zinc (6010), mg/kg dw	490	180	430	250	5.8
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Cyanide					
Cyanide, Total (9011/9012), mg/kg dw	1.2UN	1.2UN	1.5UN	1.6UN	1.3UN
Date Analyzed	11.07.93	11.07.93	11.07.93	11.07.93	11.07.93
Percent Solids, %	86	84	68	63	75

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LOG NO: S3-45997

Received: 26 OCT 93

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5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS15/CNS16)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45997-9	CNSY/S02-S06-01	10-25-93/1340	CNS16
45997-10	CNSY/S02-S07-01	10-25-93/1330	CNS16
45997-11	CNSY/S02-S08-01	10-25-93/1350	CNS16
45997-12	CNSY/S02-S09-01	10-25-93/1340	CNS16
45997-13	CNSY/S02-S10-01	10-25-93/1355	CNS16

PARAMETER	45997-9	45997-10	45997-11	45997-12	45997-13
Aluminum (6010)					
Aluminum (6010) , mg/kg dw	1000	1300	560	620	1400
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Antimony (6010)					
Antimony (6010) , mg/kg dw	6.8UN	6.3UN	6.6UN	6.2UN	6.9UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Arsenic (7060)					
Arsenic (7060), mg/kg dw	2.0N	1.3UWN	1.3UWN	1.2UWN	2.7N
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.09.93
Barium (6010)					
Barium (6010), mg/kg dw	16N	55N	20N	3.2N	3.2N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Beryllium					
Beryllium (6010), mg/kg dw	0.68UN	0.63UN	0.66UN	0.62UN	0.69UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Cadmium (6010)					
Cadmium (6010), mg/kg dw	0.68UN	0.63UN	0.66UN	0.62UN	0.69UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Calcium (6010)					
Calcium (6010), mg/kg dw	4500	7600	1900	8500	38000
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93

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LOG NO: S3-45997

Received: 26 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS15/CNS16)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45997-9	CNSY/S02-S06-01	10-25-93/1340	CNS16
45997-10	CNSY/S02-S07-01	10-25-93/1330	CNS16
45997-11	CNSY/S02-S08-01	10-25-93/1350	CNS16
45997-12	CNSY/S02-S09-01	10-25-93/1340	CNS16
45997-13	CNSY/S02-S10-01	10-25-93/1355	CNS16

PARAMETER	45997-9	45997-10	45997-11	45997-12	45997-13
Chromium (6010)					
Chromium (6010), mg/kg dw	4.2	5.4	2.2	2.3	5.6
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Cobalt (6010)					
Cobalt (6010), mg/kg dw	1.4U	1.3U	1.3U	1.2U	1.4U
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Copper (6010)					
Copper (6010), mg/kg dw	14	4.1	3.4	5.9	4.2
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Iron (6010)					
Iron (6010), mg/kg dw	2300	4900	1100	1300	2200
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Lead (7421)					
Lead (7421), mg/kg dw	14	47	6.4	6.2	7.9
Date Analyzed	11.12.93	11.12.93	11.12.93	11.12.93	11.12.93
Magnesium (6010)					
Magnesium (6010), mg/kg dw	500	650	410	420	1100
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Manganese (6010)					
Manganese (6010), mg/kg dw	23	19	9.2	11	33
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93

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45997-10	CNSY/S02-S07-01	10-25-93/1330	CNS16
45997-11	CNSY/S02-S08-01	10-25-93/1350	CNS16
45997-12	CNSY/S02-S09-01	10-25-93/1340	CNS16
45997-13	CNSY/S02-S10-01	10-25-93/1355	CNS16

PARAMETER	45997-9	45997-10	45997-11	45997-12	45997-13
Mercury					
Mercury (7470/7471), mg/kg dw	0.014U	0.013U	0.013U	0.012U	0.014U
Date Analyzed	11.05.93	11.05.93	11.05.93	11.05.93	11.05.93
Nickel (6010)					
Nickel (6010), mg/kg dw	5.5UN	5.1UN	5.3UN	5.0UN	5.6UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Potassium (6010)					
Potassium (6010), mg/kg dw	200N	160N	160N	140N	270N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Selenium (7740)					
Selenium (7740), mg/kg dw	1.4UN	1.3UN	1.3UN	1.2UN	1.4UN
Date Analyzed	11.06.93	11.06.93	11.06.93	11.06.93	11.06.93
Silver (6010)					
Silver (6010), mg/kg dw	1.4UN	1.3UN	1.3UN	1.2UN	1.4UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Sodium (6010)					
Sodium (6010) , mg/kg dw	1900N	1600N	2000N	1600N	2700N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Thallium (7841)					
Thallium (7841) , mg/kg dw	1.4UW	1.3U	1.3U	1.2U	1.4U
Date Analyzed	11.15.93	11.15.93	11.15.93	11.15.93	11.15.93

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45997-9	CNSY/S02-S06-01	10-25-93/1340	CNS16
45997-10	CNSY/S02-S07-01	10-25-93/1330	CNS16
45997-11	CNSY/S02-S08-01	10-25-93/1350	CNS16
45997-12	CNSY/S02-S09-01	10-25-93/1340	CNS16
45997-13	CNSY/S02-S10-01	10-25-93/1355	CNS16

PARAMETER	45997-9	45997-10	45997-11	45997-12	45997-13
Vanadium (6010)					
Vanadium (6010), mg/kg dw	3.9	12	2.0	2.3	4.5
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Zinc (6010)					
Zinc (6010), mg/kg dw	14	17	7.5	15	21
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Cyanide					
Cyanide, Total (9011/9012), mg/kg dw	1.4UN	1.3UN	1.3UN	1.3UN	1.4UN
Date Analyzed	11.07.93	11.07.93	11.07.93	11.07.93	11.07.93
Percent Solids, %	73	79	76	80	72

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LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45997-14	CNSY/S02-S11-01	10-25-93/1410	CNS16
45997-15	CNSY/S02-B15-01	10-25-93/1420	CNS16

PARAMETER	45997-14	45997-15
Aluminum (6010)		
Aluminum (6010) , mg/kg dw	4600	3800
Date Analyzed	11.09.93	11.09.93
Antimony (6010)		
Antimony (6010) , mg/kg dw	13UN	8.5N
Date Analyzed	11.09.93	11.09.93
Arsenic (7060)		
Arsenic (7060), mg/kg dw	4.7N	6.9N
Date Analyzed	11.09.93	11.09.93
Barium (6010)		
Barium (6010), mg/kg dw	10N	45N
Date Analyzed	11.09.93	11.09.93
Beryllium		
Beryllium (6010), mg/kg dw	1.3UN	0.54UN
Date Analyzed	11.09.93	11.09.93
Cadmium (6010)		
Cadmium (6010), mg/kg dw	1.3UN	3.2N
Date Analyzed	11.09.93	11.09.93
Calcium (6010)		
Calcium (6010), mg/kg dw	14000	58000
Date Analyzed	11.09.93	11.09.93
Chromium (6010)		
Chromium (6010), mg/kg dw	15	29
Date Analyzed	11.09.93	11.09.93

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45997-14	CNSY/S02-S11-01	10-25-93/1410	CNS16
45997-15	CNSY/S02-B1S-01	10-25-93/1420	CNS16

PARAMETER	45997-14	45997-15
Cobalt (6010)		
Cobalt (6010), mg/kg dw	2.6U	3.5
Date Analyzed	11.09.93	11.09.93
Copper (6010)		
Copper (6010), mg/kg dw	22	180
Date Analyzed	11.09.93	11.09.93
Iron (6010)		
Iron (6010), mg/kg dw	6300	17000
Date Analyzed	11.09.93	11.09.93
Lead (7421)		
Lead (7421), mg/kg dw	17	1400X
Date Analyzed	11.12.93	11.16.93
Magnesium (6010)		
Magnesium (6010), mg/kg dw	2600	1300
Date Analyzed	11.09.93	11.09.93
Manganese (6010)		
Manganese (6010), mg/kg dw	41	160
Date Analyzed	11.09.93	11.09.93
Mercury		
Mercury (7470/7471), mg/kg dw	0.036	0.20
Date Analyzed	11.05.93	11.05.93
Nickel (6010)		
Nickel (6010), mg/kg dw	10UN	29N
Date Analyzed	11.09.93	11.09.93

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45997-14	CNSY/S02-S11-01	10-25-93/1410	CNS16
45997-15	CNSY/S02-B15-01	10-25-93/1420	CNS16

PARAMETER	45997-14	45997-15
Potassium (6010)		
Potassium (6010), mg/kg dw	960N	320N
Date Analyzed	11.09.93	11.09.93
Selenium (7740)		
Selenium (7740), mg/kg dw	2.6UN	1.1UWN
Date Analyzed	11.06.93	11.06.93
Silver (6010)		
Silver (6010), mg/kg dw	2.6UN	1.1UN
Date Analyzed	11.09.93	11.09.93
Sodium (6010)		
Sodium (6010) , mg/kg dw	8900N	110N
Date Analyzed	11.09.93	11.09.93
Thallium (7841)		
Thallium (7841) , mg/kg dw	2.5U	1.1UW
Date Analyzed	11.15.93	11.15.93
Vanadium (6010)		
Vanadium (6010), mg/kg dw	13	17
Date Analyzed	11.09.93	11.09.93
Zinc (6010)		
Zinc (6010), mg/kg dw	37	490
Date Analyzed	11.09.93	11.09.93
Cyanide		
Cyanide, Total (9011/9012), mg/kg dw	2.6UN	1.1UN
Date Analyzed	11.07.93	11.07.93
Percent Solids, %	39	91

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Received: 07 OCT 93

Mr. Paul Stoddard
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5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06/CNS07)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-1	CNSY/S01-B01-01	10-06-93/0820	CNS06
45655-2	CNSY/S01-B01-02	10-06-93/0840	CNS06

PARAMETER	45655-1	45655-2
Volatiles by GC/MS (8240)		
Chloromethane, ug/kg dw	11U	11U
Bromomethane, ug/kg dw	11U	11U
Vinyl Chloride, ug/kg dw	11U	11U
Chloroethane, ug/kg dw	11U	11U
Methylene Chloride, ug/kg dw	5.7U	5.7U
Acetone, ug/kg dw	57U	140
Carbon Disulfide, ug/kg dw	5.7U	5.7U
1,1-Dichloroethene, ug/kg dw	5.7U	5.7U
1,1-Dichloroethane, ug/kg dw	5.7U	5.7U
Trans-1,2-Dichloroethylene, ug/kg dw	5.7U	5.7U
Cis-1,2-Dichloroethene, ug/kg dw	5.7U	5.7U
Chloroform, ug/kg dw	5.7U	5.7U
1,2-Dichloroethane, ug/kg dw	5.7U	5.7U
2-Butanone (MEK), ug/kg dw	57U	57U
1,1,1-Trichloroethane, ug/kg dw	5.7U	5.7U
Carbon Tetrachloride, ug/kg dw	5.7U	5.7U
Vinyl Acetate, ug/kg dw	11U	11U
Bromodichloromethane, ug/kg dw	5.7U	5.7U
1,1,2,2-Tetrachloroethane, ug/kg dw	5.7U	5.7U
1,2-Dichloropropane, ug/kg dw	5.7U	5.7U
Trans-1,3-Dichloropropene, ug/kg dw	5.7U	5.7U
Trichloroethene, ug/kg dw	5.7U	5.7U

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Purchase Order: 041100/93

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Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-1	CNSY/S01-B01-01	10-06-93/0820	CNS06
45655-2	CNSY/S01-B01-02	10-06-93/0840	CNS06

PARAMETER	45655-1	45655-2
Dibromochloromethane, ug/kg dw	5.7U	5.7U
1,1,2-Trichloroethane, ug/kg dw	5.7U	5.7U
Benzene, ug/kg dw	5.7U	5.7U
Cis-1,3-Dichloropropene, ug/kg dw	5.7U	5.7U
Bromoform, ug/kg dw	5.7U	5.7U
2-Hexanone, ug/kg dw	57U	57U
4-Methyl-2-pentanone (MIBK), ug/kg dw	57U	57U
Tetrachloroethene, ug/kg dw	5.7U	5.7U
Toluene, ug/kg dw	5.7U	5.7U
Chlorobenzene, ug/kg dw	5.7U	6.0
Ethylbenzene, ug/kg dw	5.7U	5.7U
Styrene, ug/kg dw	5.7U	5.7U
Xylenes, ug/kg dw	5.7U	5.7U
Surrogate - Toluene-d8	69 %	72 %
Surrogate - 4-Bromofluorobenzene	66 %	69 %
Surrogate - 1,2-Dichloroethane-d4	69 %	63 %
Date Analyzed	10.17.93	10.17.93

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45655-1	CNSY/S01-B01-01	10-06-93/0820	CNS06
45655-2	CNSY/S01-B01-02	10-06-93/0840	CNS06

PARAMETER	45655-1	45655-2
Semivolatiles (8270)		
Phenol, ug/kg dw	380U	380U
bis(2-Chloroethyl)ether, ug/kg dw	380U	380U
2-Chlorophenol, ug/kg dw	380U	380U
1,3-Dichlorobenzene, ug/kg dw	380U	380U
1,4-Dichlorobenzene, ug/kg dw	380U	380U
1,2-Dichlorobenzene, ug/kg dw	380U	380U
2-Methylphenol (o-cresol), ug/kg dw	380U	380U
Bis(2-chloroisopropyl)ether, ug/kg dw	380U	380U
3-Methylphenol/4-Methylphenol(m&p-cresol), ug/kg dw	380U	380U
N-Nitroso-di-n-propylamine, ug/kg dw	380U	380U
Hexachloroethane, ug/kg dw	380U	380U
Nitrobenzene, ug/kg dw	380U	380U
Isophorone, ug/kg dw	380U	380U
2-Nitrophenol, ug/kg dw	380U	380U
2,4-Dimethylphenol, ug/kg dw	380U	380U
bis(2-Chloroethoxy)methane, ug/kg dw	380U	380U
2,4-Dichlorophenol, ug/kg dw	380U	380U
1,2,4-Trichlorobenzene, ug/kg dw	380U	380U
Naphthalene, ug/kg dw	380U	380U
4-Chloroaniline, ug/kg dw	750U	750U
Hexachlorobutadiene, ug/kg dw	380U	380U
4-Chloro-3-methylphenol, ug/kg dw	380U	380U

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45655-1	CNSY/S01-B01-01	10-06-93/0820	CNS06
45655-2	CNSY/S01-B01-02	10-06-93/0840	CNS06

PARAMETER	45655-1	45655-2
2-Methylnaphthalene, ug/kg dw	380U	380U
Hexachlorocyclopentadiene, ug/kg dw	380U	380U
2,4,6-Trichlorophenol, ug/kg dw	380U	380U
2,4,5-Trichlorophenol, ug/kg dw	1900U	1900U
2-Chloronaphthalene, ug/kg dw	380U	380U
2-Nitroaniline, ug/kg dw	1900U	1900U
Dimethylphthalate, ug/kg dw	380U	380U
Acenaphthylene, ug/kg dw	380U	380U
3-Nitroaniline, ug/kg dw	1900U	1900U
Acenaphthene, ug/kg dw	380U	380U
2,4-Dinitrophenol, ug/kg dw	1900U	1900U
4-Nitrophenol, ug/kg dw	1900U	1900U
Dibenzofuran, ug/kg dw	380U	380U
2,4-Dinitrotoluene, ug/kg dw	380U	380U
2,6-Dinitrotoluene, ug/kg dw	380U	380U
Diethylphthalate, ug/kg dw	380U	380U
4-Chlorophenyl-phenyl ether, ug/kg dw	380U	380U
Fluorene, ug/kg dw	380U	380U
4-Nitroaniline, ug/kg dw	1900U	1900U
4,6-Dinitro-2-methylphenol, ug/kg dw	1900U	1900U
N-Nitrosodiphenylamine/Diphenylamine, ug/kg dw	380U	380U
4-Bromophenyl-phenyl-ether, ug/kg dw	380U	380U
Hexachlorobenzene, ug/kg dw	380U	380U

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45655-1	CNSY/S01-B01-01	10-06-93/0820	CNS06
45655-2	CNSY/S01-B01-02	10-06-93/0840	CNS06

PARAMETER	45655-1	45655-2
Pentachlorophenol, ug/kg dw	1900U	1900U
Phenanthrene, ug/kg dw	380U	380U
Anthracene, ug/kg dw	380U	380U
Di-n-butylphthalate, ug/kg dw	380U	380U
Fluoranthene, ug/kg dw	380U	380U
Pyrene, ug/kg dw	380U	380U
Butylbenzylphthalate, ug/kg dw	380U	380U
3,3'-Dichlorobenzidine, ug/kg dw	750U	750U
Benzo(a)anthracene, ug/kg dw	380U	380U
bis(2-Ethylhexyl)phthalate, ug/kg dw	380U	380U
Chrysene, ug/kg dw	380U	380U
Di-n-octylphthalate, ug/kg dw	380U	380U
Benzo(b)fluoranthene, ug/kg dw	380U	380U
Carbazole, ug/kg dw	380U	380U
Benzo(k)fluoranthene, ug/kg dw	380U	380U
Benzo(a)pyrene, ug/kg dw	380U	380U
Indeno(1,2,3-cd)pyrene, ug/kg dw	380U	380U
Dibenz(a,h)anthracene, ug/kg dw	380U	380U
Benzo(g,h,i)perylene, ug/kg dw	380U	380U
Surrogate - Phenol d 5	63 %	90 %
Surrogate - 2-Fluorophenol	50 %	75 %
Surrogate - 2,4,6-Tribromophenol	102 %	105 %
Surrogate - Nitrobenzene d-5	56 %	83 %
Surrogate - 2-Fluorobiphenyl	59 %	80 %
Surrogate - Terphenyl	79 %	80 %
Date Extracted	10.13.93	10.13.93
Date Analyzed	10.20.93	10.20.93

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5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: S3-45655

Received: 07 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06/CNS07)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-1	CNSY/S01-B01-01	10-06-93/0820	CNS06
45655-2	CNSY/S01-B01-02	10-06-93/0840	CNS06

PARAMETER	45655-1	45655-2
Pesticides (8080)		
alpha-BHC, ug/kg dw	1.9U	1.9U
beta-BHC, ug/kg dw	1.9U	1.9U
delta-BHC, ug/kg dw	1.9U	1.9U
gamma-BHC, ug/kg dw	1.9U	1.9U
Heptachlor, ug/kg dw	1.9U	1.9U
Aldrin, ug/kg dw	1.9U	1.9U
Heptachlor epoxide, ug/kg dw	1.9U	1.9U
Endosulfan I, ug/kg dw	1.9U	1.9U
Dieldrin, ug/kg dw	3.7U	3.7U
4,4'-DDE, ug/kg dw	3.7U	3.7U
Endrin, ug/kg dw	3.7U	3.7U
Endosulfan II, ug/kg dw	3.7U	3.7U
4,4'-DDD, ug/kg dw	3.7U	3.7U
Endosulfan sulfate, ug/kg dw	3.7U	3.7U
4,4'-DDT, ug/kg dw	3.7U	3.7U
Endrin ketone, ug/kg dw	3.7U	3.7U
Methoxychlor, ug/kg dw	19U	19U
alpha-Chlordane, ug/kg dw	1.9U	1.9U
gamma-Chlordane, ug/kg dw	1.9U	1.9U
Toxaphene, ug/kg dw	190U	190U
Aroclor-1016, ug/kg dw	37U	37U
Aroclor-1221, ug/kg dw	74U	76U

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45655-1	CNSY/S01-B01-01	10-06-93/0820	CNS06
45655-2	CNSY/S01-B01-02	10-06-93/0840	CNS06

PARAMETER	45655-1	45655-2
Aroclor-1232, ug/kg dw	37U	37U
Aroclor-1242, ug/kg dw	37U	37U
Aroclor-1248, ug/kg dw	37U	37U
Aroclor-1254, ug/kg dw	37U	37U
Aroclor-1260, ug/kg dw	37U	37U
Endrin Aldehyde, ug/kg dw	3.7U	3.7U
% R Surrogate-TCX	36 %	40 %
% R Surrogate-DBC	65 %	40 %
Date Extracted	10.11.93	10.11.93
Date Analyzed	11.13.93	11.13.93
Aluminum (6010)		
Aluminum (6010) , mg/kg dw	2500	4400
Date Analyzed	11.02.93	11.02.93
Antimony (6010)		
Antimony (6010) , mg/kg dw	5.7UN	5.7UN
Date Analyzed	11.02.93	11.02.93
Arsenic (7060)		
Arsenic (7060), mg/kg dw	1.1UN	1.8N
Date Analyzed	11.01.93	11.01.93
Barium (6010)		
Barium (6010), mg/kg dw	7.0	14
Date Analyzed	11.02.93	11.02.93
Beryllium		
Beryllium (6010), mg/kg dw	0.57U	0.57U
Date Analyzed	11.02.93	11.02.93

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45655-1	CNSY/S01-B01-01	10-06-93/0820	CNS06
45655-2	CNSY/S01-B01-02	10-06-93/0840	CNS06

PARAMETER	45655-1	45655-2
Cadmium (6010)		
Cadmium (6010), mg/kg dw	0.57U	0.57U
Date Analyzed	11.02.93	11.02.93
Calcium (6010)		
Calcium (6010), mg/kg dw	2900	38000
Date Analyzed	11.02.93	11.02.93
Chromium (6010)		
Chromium (6010), mg/kg dw	3.5	8.8
Date Analyzed	11.02.93	11.02.93
Cobalt (6010)		
Cobalt (6010), mg/kg dw	1.1U	1.1U
Date Analyzed	11.02.93	11.02.93
Copper (6010)		
Copper (6010), mg/kg dw	2.8UN	3.5N
Date Analyzed	11.02.93	11.02.93
Iron (6010)		
Iron (6010), mg/kg dw	490	4100
Date Analyzed	11.02.93	11.02.93
Lead (7421)		
Lead (7421), mg/kg dw	7.1N	5.4N
Date Analyzed	11.03.93	11.03.93
Magnesium (6010)		
Magnesium (6010), mg/kg dw	110	840
Date Analyzed	11.02.93	11.02.93

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45655-1	CNSY/S01-B01-01	10-06-93/0820	CNS06
45655-2	CNSY/S01-B01-02	10-06-93/0840	CNS06

PARAMETER	45655-1	45655-2			
Manganese (6010)					
Manganese (6010), mg/kg dw	3.1	83			
Date Analyzed	11.02.93	11.02.93			
Mercury					
Mercury (7470/7471), mg/kg dw	0.033N*	0.023N*			
Date Analyzed	10.20.93	10.20.93			
Nickel (6010)					
Nickel (6010), mg/kg dw	4.5U	4.9			
Date Analyzed	11.02.93	11.02.93			
Potassium (6010)					
Potassium (6010), mg/kg dw	110U	200			
Date Analyzed	11.02.93	11.02.93			
Selenium (7740)					
Selenium (7740), mg/kg dw	1.1UWN	5.7UN			
Date Analyzed	11.01.93	11.02.93			
Silver (6010)					
Silver (6010), mg/kg dw	1.1U	1.1U			
Date Analyzed	11.02.93	11.02.93			
Sodium (6010)					
Sodium (6010) , mg/kg dw	57U	230			
Date Analyzed	11.02.93	11.02.93			
Thallium (7841)					
Thallium (7841) , mg/kg dw	1.1UN	1.1UWN			
Date Analyzed	11.03.93	11.03.93			

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LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-1	CNSY/S01-B01-01	10-06-93/0820	CNS06
45655-2	CNSY/S01-B01-02	10-06-93/0840	CNS06

PARAMETER	45655-1	45655-2
Vanadium (6010)		
Vanadium (6010), mg/kg dw	1.6	8.5
Date Analyzed	11.02.93	11.02.93
Zinc (6010)		
Zinc (6010), mg/kg dw	7.1N	9.4N
Date Analyzed	11.02.93	11.02.93
Cyanide		
Cyanide, Total (9011/9012), mg/kg dw	1.1UN*	1.1UN*
Date Analyzed	10.17.93	10.17.93
Percent Solids, %	88	88

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Purchase Order: 041100/93

Project: CTO-029 (SDG CNS14)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46088A-1	CNSY/S01-B02-01	10-27-93/1500	CNS14
46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
Volatiles by GC/MS (8240)					
Chloromethane, ug/kg dw	12U	15U	59U*F34	22U	11U
Bromomethane, ug/kg dw	12U	15U	59U	22U	11U
Vinyl Chloride, ug/kg dw	12U	15U	59U	22U	11U
Chloroethane, ug/kg dw	12U	15U	59U	22U	11U
Methylene Chloride (Dichloromethane), ug/kg dw	1.8J	7.7U	29U	11U	5.6U
Acetone, ug/kg dw	90	110	110J	110U	56
Carbon Disulfide, ug/kg dw	5.9U	2.0J	29U	14	5.6U
1,1-Dichloroethene, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
1,1-Dichloroethane, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Trans-1,2-Dichloroethylene, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Cis-1,2-Dichloroethene, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Chloroform, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
1,2-Dichloroethane, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
2-Butanone (MEK), ug/kg dw	3.3J	77U	13J	93J	7.8J
1,1,1-Trichloroethane, ug/kg dw	2.9J	8.3	8.6J	3.9J	2.9J
Carbon Tetrachloride, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Vinyl Acetate, ug/kg dw	12U	15U	59U	22U	11U

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EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS14)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46088A-1	CNSY/S01-B02-01	10-27-93/1500	CNS14
46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
Bromodichloromethane, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
1,1,2,2-Tetrachloroethane, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
1,2-Dichloropropane, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Trans-1,3-Dichloropropene, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Trichloroethene, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Dibromochloromethane, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
1,1,2-Trichloroethane, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Benzene, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Cis-1,3-Dichloropropene, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Bromoform, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
2-Hexanone, ug/kg dw	59U	77U	290U	110U	56U
4-Methyl-2-pentanone (MIBK), ug/kg dw	59U	77U	290U	110U	56U
Tetrachloroethene, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Toluene, ug/kg dw	2.9J	8.9	5.2J	3.9J	1.5J
Chlorobenzene, ug/kg dw	29	39	29U	11U	5.6U
Ethylbenzene, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Styrene, ug/kg dw	5.9U	7.7U	29U	11U	5.6U
Xylenes, ug/kg dw	2.6J	5.0J	7.6J	3.3J	1.7J
Surrogate - Toluene-d8	109 %	120 %	97 %	119 %	94 %
Surrogate - 4-Bromofluorobenzene	72 %	86 %	79 %	83 %	79 %
Surrogate - 1,2-Dichloroethane-d4	90 %	95 %	89 %	96 %	92 %
Date Analyzed	11.09.93	11.09.93	11.09.93	11.10.93	11.09.93

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46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
Semivolatiles (8270)					
Phenol, ug/kg dw	380U	500U	380U	730U	360U
bis(2-Chloroethyl)ether, ug/kg dw	380U	500U	380U	730U	360U
2-Chlorophenol, ug/kg dw	380U	500U	380U	730U	360U
1,3-Dichlorobenzene, ug/kg dw	380U	500U	380U	730U	360U
1,4-Dichlorobenzene, ug/kg dw	380U	500U	380U	730U	360U
1,2-Dichlorobenzene, ug/kg dw	380U	500U	380U	730U	360U
2-Methylphenol (o-cresol), ug/kg dw	380U	500U	380U	730U	360U
Bis(2-chloroisopropyl)ether , ug/kg dw	380U	500U	380U	730U	360U
3-Methylphenol/4-Methylphenol(m&p-cresol), ug/kg dw	380U	500U	380U	730U	360U
N-Nitroso-di-n-propylamine, ug/kg dw	380U	500U	380U	730U	360U
Hexachloroethane, ug/kg dw	380U	500U	380U	730U	360U
Nitrobenzene, ug/kg dw	380U	500U	380U	730U	360U
Isophorone, ug/kg dw	380U	500U	380U	730U	360U
2-Nitrophenol, ug/kg dw	380U	500U	380U	730U	360U
2,4-Dimethylphenol, ug/kg dw	380U	500U	380U	730U	360U

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46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
bis(2-Chloroethoxy)methane, ug/kg dw	380U	500U	380U	730U	360U
2,4-Dichlorophenol, ug/kg dw	380U	500U	380U	730U	360U
1,2,4-Trichlorobenzene, ug/kg dw	380U	500U	380U	730U	360U
Naphthalene, ug/kg dw	380U	500U	380U	730U	360U
4-Chloroaniline, ug/kg dw	770U	1000U	760U	1500U	720U
Hexachlorobutadiene, ug/kg dw	380U	500U	380U	730U	360U
4-Chloro-3-methylphenol, ug/kg dw	380U	500U	380U	730U	360U
2-Methylnaphthalene, ug/kg dw	380U	500U	380U	730U	360U
Hexachlorocyclopentadiene, ug/kg dw	380U	500U	380U	730U	360U
2,4,6-Trichlorophenol, ug/kg dw	380U	500U	380U	730U	360U
2,4,5-Trichlorophenol, ug/kg dw	2000U	2600U	2000U	3800U	1900U
2-Chloronaphthalene, ug/kg dw	380U	500U	380U	730U	360U
2-Nitroaniline, ug/kg dw	2000U	2600U	2000U	3800U	1900U
Dimethylphthalate, ug/kg dw	380U	500U	380U	730U	360U
Acenaphthylene, ug/kg dw	380U	500U	380U	730U	360U
3-Nitroaniline, ug/kg dw	2000U	2600U	2000U	3800U	1900U
Acenaphthene, ug/kg dw	380U	500U	380U	730U	360U
2,4-Dinitrophenol, ug/kg dw	2000U	2600U	2000U	3800U	1900U

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46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
4-Nitrophenol, ug/kg dw	2000U	2600U	2000U	3800U	1900U
Dibenzofuran, ug/kg dw	380U	500U	380U	730U	360U
2,4-Dinitrotoluene, ug/kg dw	380U	500U	380U	730U	360U
2,6-Dinitrotoluene, ug/kg dw	380U	500U	380U	730U	360U
Diethylphthalate, ug/kg dw	380U	500U	380U	730U	360U
4-Chlorophenyl-phenyl ether, ug/kg dw	380U	500U	380U	730U	360U
Fluorene, ug/kg dw	380U	500U	380U	730U	360U
4-Nitroaniline, ug/kg dw	2000U	2600U	2000U	3800U	1900U
4,6-Dinitro-2-methylphenol, ug/kg dw	2000U	2600U	2000U	3800U	1900U
N-Nitrosodiphenylamine/Diphenylamine, ug/kg dw	380U	500U	380U	730U	360U
4-Bromophenyl-phenyl-ether, ug/kg dw	380U	500U	380U	730U	360U
Hexachlorobenzene, ug/kg dw	380U	500U	380U	730U	360U
Pentachlorophenol, ug/kg dw	2000U	2600U	2000U	3800U	1900U
Phenanthrene, ug/kg dw	100J	500U	380U	660J	100J
Anthracene, ug/kg dw	380U	500U	380U	200J	360U
Di-n-butylphthalate, ug/kg dw	380U	500U	380U	730U	360U

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LOG NO: S3-46088A

Received: 29 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS14)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46088A-1	CNSY/S01-B02-01	10-27-93/1500	CNS14
46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
Fluoranthene, ug/kg dw	240J	500U	220J	1200	210J
Pyrene, ug/kg dw	300J	500U	120J	1700	230J
Butylbenzylphthalate, ug/kg dw	380U	500U	380U	730U	360U
3,3'-Dichlorobenzidine, ug/kg dw	770U	1000U	760U	730U	720U
Benzo(a)anthracene, ug/kg dw	120J	500U	380U	820	360U
bis(2-Ethylhexyl)phthalate, ug/kg dw	380U	500U	380U	730U	360U
Chrysene, ug/kg dw	140J	500U	380U	850	68J
Di-n-octylphthalate, ug/kg dw	380U	500U	380U	730U	360U
Benzo(b)fluoranthene, ug/kg dw	150J	500U	69J	910	360U
Carbazole, ug/kg dw	380U	500U	380U	93J	360U
Benzo(k)fluoranthene, ug/kg dw	67J	500U	380U	370J	360U
Benzo(a)pyrene, ug/kg dw	110J	500U	380U	720J	360U
Indeno(1,2,3-cd)pyrene, ug/kg dw	97J	500U	380U	430J	360U
Dibenz(a,h)anthracene, ug/kg dw	380U	500U	380U	140J	360U
Benzo(g,h,i)perylene, ug/kg dw	98J	500U	380U	390J	360U
Surrogate - Phenol d 5	99 %	105 %	106 %	98 %	112 %
Surrogate - 2-Fluorophenol	84 %	89 %	86 %	82 %	95 %
Surrogate - 2,4,6-Tribromophenol	75 %	71 %	58 %	69 %	69 %
Surrogate - Nitrobenzene d-5	97 %	99 %	98 %	90 %	103 %
Surrogate - 2-Fluorobiphenyl	95 %	96 %	152 %	90 %	99 %
Surrogate - Terphenyl	111 %	108 %	90 %	96 %	108 %
Date Extracted	11.02.93	11.02.93	11.02.93	11.02.93	11.02.93
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93

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REPORT OF RESULTS

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46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
Pesticides (8080)					
alpha-BHC, ug/kg dw	2.0U	2.6U	2.0U	3.8U	1.9U
beta-BHC, ug/kg dw	2.0U	2.6U	2.0U	3.8U	1.9U
delta-BHC, ug/kg dw	2.0U	2.6U	2.0U	3.8U	1.9U
gamma-BHC, ug/kg dw	2.0U	2.6U	2.0U	3.8U	1.9U
Heptachlor, ug/kg dw	2.0U	2.6U	2.0U	3.8U	1.9U
Aldrin, ug/kg dw	2.0U	2.6U	2.0U	3.8U	1.9U
Heptachlor epoxide, ug/kg dw	2.0U	2.6U	2.0U	3.8U	1.9U
Endosulfan I, ug/kg dw	2.0U	2.6U	2.0U	3.8U	1.9U
Dieldrin, ug/kg dw	3.9U	5.1U	3.9U	7.3U	3.7U
4,4'-DDE, ug/kg dw	4.1	5.1U	43D	13	3.7U
Endrin, ug/kg dw	3.9U	5.1U	3.9U	7.3U	3.7U
Endosulfan II, ug/kg dw	3.9U	5.1U	3.9U	7.3U	3.7U
4,4'-DDD, ug/kg dw	3.9U	5.1U	13P	150D	3.7U
Endosulfan sulfate, ug/kg dw	3.9U	5.1U	3.9U	7.3U	3.7U
4,4'-DDT, ug/kg dw	12P	5.1U	32DP	74	3.7U
Endrin ketone, ug/kg dw	3.9U	5.1U	3.9U	7.3U	3.7U
Methoxychlor, ug/kg dw	20U	26U	20U	38U	19U
alpha-Chlordane, ug/kg dw	2.0U	2.6U	3.8	7.2	1.9U
gamma-Chlordane, ug/kg dw	2.0U	2.6U	9.5	9.3P	1.9U

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REPORT OF RESULTS

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46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
Toxaphene, ug/kg dw	200U	260U	200U	380U	190U
Aroclor-1016, ug/kg dw	39U	51U	39U	73U	37U
Aroclor-1221, ug/kg dw	79U	100U	79U	150U	74U
Aroclor-1232, ug/kg dw	39U	51U	39U	73U	37U
Aroclor-1242, ug/kg dw	39U	51U	39U	73U	37U
Aroclor-1248, ug/kg dw	39U	51U	39U	73U	37U
Aroclor-1254, ug/kg dw	39U	51U	39U	73U	37U
Aroclor-1260, ug/kg dw	39U	51U	39U	73U	37U
Endrin Aldehyde, ug/kg dw	3.9U	5.1U	3.9U	7.3U	3.7U
% R Surrogate-TCX	85 %	60 %	52 %	61 %	85 %
% R Surrogate-DBC	40 %	5.0 %Z	74 %	27 %Z	24 %Z
Date Extracted	11.03.93	11.03.93	11.03.93	11.03.93	11.03.93
Date Analyzed	12.07.93	12.07.93	12.04.93	12.07.93	12.07.93
Aluminum (6010)					
Aluminum (6010) , mg/kg dw	7630	6050	6170	29100	1160
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Antimony (6010)					
Antimony (6010) , mg/kg dw	17.5N*	7.7UN*	5.9UN*	11.2UN*	5.6UN*
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Arsenic (7060)					
Arsenic (7060), mg/kg dw	9.4	15.3U	4.7	24.3	6.1
Date Analyzed	11.05.93	11.09.93	11.05.93	11.08.93	11.05.93

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REPORT OF RESULTS

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46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
Barium (6010)					
Barium (6010), mg/kg dw	98.4	10.0	22.4	43.2	6.2
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Beryllium					
Beryllium (6010), mg/kg dw	0.59U	0.77U	0.59U	1.4	0.56U
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Cadmium (6010)					
Cadmium (6010), mg/kg dw	1.2	0.77U	1.1	1.1U	0.56U
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Calcium (6010)					
Calcium (6010), mg/kg dw	38100*	254000*	18500*	18400*	255000*
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Chromium (6010)					
Chromium (6010), mg/kg dw	38.7	53.0	95.0	49.3	6.0
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Cobalt (6010)					
Cobalt (6010), mg/kg dw	1.9	1.5U	2.7	9.9	2.4
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Copper (6010)					
Copper (6010), mg/kg dw	443N	16.8N	16.5N	34.8N	8.6N
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93

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REPORT OF RESULTS

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46088A-1	CNSY/S01-B02-01	10-27-93/1500	CNS14
46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
Iron (6010)					
Iron (6010), mg/kg dw	8470	5180	13200	38000	3250
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Lead (7421)					
Lead (7421), mg/kg dw	228N	10.4N	13.1N	64.9	11.4
Date Analyzed	11.08.93	11.17.93	11.17.93	11.17.93	11.17.93
Magnesium (6010)					
Magnesium (6010), mg/kg dw	1420	7040	645	6270	2500
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Manganese (6010)					
Manganese (6010), mg/kg dw	109N	40.0N	72.9N	716N	136N
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Mercury					
Mercury (7470/7471), mg/kg dw	14.8N	0.24N	0.04N	0.38N	0.03N
Date Analyzed	11.05.93	11.03.93	11.03.93	11.03.93	11.03.93
Nickel (6010)					
Nickel (6010), mg/kg dw	9.0	26.7	6.1	16.4	7.8
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Potassium (6010)					
Potassium (6010), mg/kg dw	466	1140	233	3170	318
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93

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46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
Selenium (7740)					
Selenium (7740), mg/kg dw	1.2UN	7.7UWN	5.9UWN	11.2UWN	5.6UWN
Date Analyzed	11.05.93	11.08.93	11.08.93	11.08.93	11.08.93
Silver (6010)					
Silver (6010), mg/kg dw	1.2U	1.5U	1.2U	2.2U	1.1U
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Sodium (6010)					
Sodium (6010) , mg/kg dw	252	1000	58.9U	3570	374
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Thallium (7841)					
Thallium (7841) , mg/kg dw	1.2U	7.7U	1.2U	2.2U	5.6U
Date Analyzed	11.12.93	11.12.93	11.12.93	11.12.93	11.12.93
Vanadium (6010)					
Vanadium (6010), mg/kg dw	55.0	30.2	17.5	76.2	5.2
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Zinc (6010)					
Zinc (6010), mg/kg dw	369	65.3	28.1	142	25.8
Date Analyzed	11.08.93	11.08.93	11.08.93	11.08.93	11.08.93
Cyanide					
Cyanide, Total (9011/9012), mg/kg dw	1.2UN	1.5UN	1.2UN	2.2UN	1.1UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.10.93	11.10.93

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46088A-2	CNSY/S01-B02-02	10-27-93/1510	CNS14
46088A-3	CNSY/S06-B25-1D	10-27-93/1220	CNS14
46088A-4	CNSY/S06-B27-2D	10-27-93/0910	CNS14
46088A-5	CNSY/S08-B25-1D	10-28-93/0800	CNS14

PARAMETER	46088A-1	46088A-2	46088A-3	46088A-4	46088A-5
Percent Solids, %	85	65	85	45	90

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Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06)
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45616-1	CNSY/S02-B01-01	10-05-93/1350	CNS06
45616-2	CNSY/S02-B01-02	10-05-93/1355	CNS06

PARAMETER	45616-1	45616-2
Aluminum (6010)		
Aluminum (6010) , mg/kg dw	4300	3300
Date Analyzed	10.21.93	10.21.93
Antimony (6010)		
Antimony (6010) , mg/kg dw	6.1UN	5.6UN
Date Analyzed	10.21.93	10.21.93
Arsenic (7060)		
Arsenic (7060), mg/kg dw	7.6N	1.3N
Date Analyzed	10.22.93	10.21.93
Barium (6010)		
Barium (6010), mg/kg dw	38	18
Date Analyzed	10.21.93	10.21.93
Beryllium		
Beryllium (6010), mg/kg dw	0.61U	0.56U
Date Analyzed	10.21.93	10.21.93
Cadmium (6010)		
Cadmium (6010), mg/kg dw	1.7	0.56U
Date Analyzed	10.21.93	10.21.93
Calcium (6010)		
Calcium (6010), mg/kg dw	15000	920
Date Analyzed	10.21.93	10.21.93
Chromium (6010)		
Chromium (6010), mg/kg dw	26	4.6
Date Analyzed	10.21.93	10.21.93

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45616-1	CNSY/S02-B01-01	10-05-93/1350	CNS06
45616-2	CNSY/S02-B01-02	10-05-93/1355	CNS06

PARAMETER	45616-1	45616-2
Cobalt (6010)		
Cobalt (6010), mg/kg dw	3.9	1.1U
Date Analyzed	10.21.93	10.21.93
Copper (6010)		
Copper (6010), mg/kg dw	44N	2.8UN
Date Analyzed	10.21.93	10.21.93
Iron (6010)		
Iron (6010), mg/kg dw	21000	3200
Date Analyzed	10.21.93	10.21.93
Lead (7421)		
Lead (7421), mg/kg dw	160N	2.3N
Date Analyzed	10.21.93	10.28.93
Magnesium (6010)		
Magnesium (6010), mg/kg dw	530	230
Date Analyzed	10.21.93	10.21.93
Manganese (6010)		
Manganese (6010), mg/kg dw	81	61
Date Analyzed	10.21.93	10.21.93
Mercury		
Mercury (7470/7471), mg/kg dw	0.11N*	0.024N*
Date Analyzed	10.20.93	10.20.93
Nickel (6010)		
Nickel (6010), mg/kg dw	23	4.4U
Date Analyzed	10.21.93	10.21.93

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45616-1	CNSY/S02-B01-01	10-05-93/1350	CNS06
45616-2	CNSY/S02-B01-02	10-05-93/1355	CNS06

PARAMETER	45616-1	45616-2
Potassium (6010)		
Potassium (6010), mg/kg dw	180	110
Date Analyzed	10.21.93	10.21.93
Selenium (7740)		
Selenium (7740), mg/kg dw	1.2UWN	1.1UWN
Date Analyzed	10.22.93	10.22.93
Silver (6010)		
Silver (6010), mg/kg dw	1.2U	1.1U
Date Analyzed	10.21.93	10.21.93
Sodium (6010)		
Sodium (6010) , mg/kg dw	61U	56U
Date Analyzed	10.21.93	10.21.93
Thallium (7841)		
Thallium (7841) , mg/kg dw	1.2UW	1.1UW
Date Analyzed	10.26.93	10.26.93
Vanadium (6010)		
Vanadium (6010), mg/kg dw	38	6.3
Date Analyzed	10.21.93	10.21.93
Zinc (6010)		
Zinc (6010), mg/kg dw	220N	4.6N
Date Analyzed	10.21.93	10.21.93
Cyanide		
Cyanide, Total (9011/9012), mg/kg dw	1.2UN*	1.1UN*
Date Analyzed	10.17.93	10.17.93
Percent Solids, %	82	90

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: 93-45655

Received: 07 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06/CNS07)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-8	CNSY/S02-B02-01	10-06-93/1020	CNS07
45655-9	CNSY/S02-B02-02	10-06-93/1035	CNS07
45655-10	CNSY/S02-B08-02	10-06-93/1110	CNS07
655-11	CNSY/S02-B03-01	10-06-93/1335	CNS07
655-12	CNSY/S02-B09-01	10-06-93/1345	CNS07

PARAMETER	45655-8	45655-9	45655-10	45655-11	45655-12
Aluminum (6010)					
Aluminum (6010) , mg/kg dw	6100	3200	2400	5600	2700
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Antimony (6010)					
Antimony (6010) , mg/kg dw	5.8UN	5.9UN	5.3UN	5.4UN	11N
Date Analyzed	11.02.93	11.02.93	11.02.93	11.02.93	11.02.93
Arsenic (7060)					
Arsenic (7060), mg/kg dw	3.2	1.5	2.1U	2.8	12
Date Analyzed	11.02.93	11.01.93	11.01.93	11.01.93	11.01.93
Barium (6010)					
Barium (6010), mg/kg dw	15	12	10	15	51
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Beryllium					
Beryllium (6010), mg/kg dw	0.58U	0.59U	0.53U	0.54U	0.56U
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Cadmium (6010)					
Cadmium (6010), mg/kg dw	0.58U	0.58U	0.53U	0.54U	1.5
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Calcium (6010)					
Calcium (6010), mg/kg dw	92000	890	3100	62000	1300
Date Analyzed	11.03.93	11.03.93	11.03.93	11.03.93	11.03.93

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LOG NO: S3-45655

Received: 07 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CMS06/CMS07)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-8	CMSY/S02-B02-01	10-06-93/1020	CMS07
45655-9	CMSY/S02-B02-02	10-06-93/1035	CMS07
45655-10	CMSY/S02-B08-02	10-06-93/1110	CMS07
5655-11	CMSY/S02-B03-01	10-06-93/1335	CMS07
5655-12	CMSY/S02-B09-01	10-06-93/1345	CMS07

PARAMETER	45655-8	45655-9	45655-10	45655-11	45655-12
Chromium (6010)					
Chromium (6010), mg/kg dw	23	5.6	3.9	12	34
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Cobalt (6010)					
Cobalt (6010), mg/kg dw	1.3	1.2U	1.1U	1.1U	2.7
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Copper (6010)					
Copper (6010), mg/kg dw	10	2.9U	2.6U	6.5	52
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Iron (6010)					
Iron (6010), mg/kg dw	7200	4700	2700	7000	11000
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Lead (7421)					
Lead (7421), mg/kg dw	31N*	3.0N*	3.5N*	17N*	570N*
Date Analyzed	11.03.93	11.04.93	11.03.93	11.01.93	11.01.93
Magnesium (6010)					
Magnesium (6010), mg/kg dw	2800N	170N	190N	770N	130N
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Manganese (6010)					
Manganese (6010), mg/kg dw	34	35	27	32	46
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93

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Purchase Order: 041100/93

Project: CTO-029 (SDG CMS06/CMS07)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-8	CMSY/S02-B02-01	10-06-93/1020	CMS07
45655-9	CMSY/S02-B02-02	10-06-93/1035	CMS07
45655-10	CMSY/S02-B08-02	10-06-93/1110	CMS07
45655-11	CMSY/S02-B03-01	10-06-93/1335	CMS07
45655-12	CMSY/S02-B09-01	10-06-93/1345	CMS07

PARAMETER	45655-8	45655-9	45655-10	45655-11	45655-12
Mercury					
Mercury (7470/7471), mg/kg dw	0.027	0.022	0.018	0.031	0.11
Date Analyzed	10.22.93	10.22.93	10.22.93	10.22.93	10.22.93
Nickel (6010)					
Nickel (6010), mg/kg dw	13	4.7U	4.2U	4.3U	19
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Potassium (6010)					
Potassium (6010), mg/kg dw	430	120U	110U	260	120
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Selenium (7740)					
Selenium (7740), mg/kg dw	1.2UWN	1.2UWN	1.1UWN	1.1UWN	1.1UWN
Date Analyzed	10.29.93	10.29.93	10.29.93	10.29.93	10.29.93
Silver (6010)					
Silver (6010), mg/kg dw	1.2UN	1.2UN	1.1UN	1.1UN	1.1UN
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Sodium (6010)					
Sodium (6010) , mg/kg dw	320	59	53U	200	56U
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Thallium (7841)					
Thallium (7841) , mg/kg dw	5.8UN	1.2UN	1.1UWN	1.1UWN	1.1UWN
Date Analyzed	11.03.93	11.03.93	11.03.93	11.03.93	11.03.93

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LOG NO: S3-45655

Received: 07 OCT 93

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5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06/CNS07)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-8	CNSY/S02-B02-01	10-06-93/1020	CNS07
45655-9	CNSY/S02-B02-02	10-06-93/1035	CNS07
45655-10	CNSY/S02-B08-02	10-06-93/1110	CNS07
45655-11	CNSY/S02-B03-01	10-06-93/1335	CNS07
45655-12	CNSY/S02-B09-01	10-06-93/1345	CNS07

PARAMETER	45655-8	45655-9	45655-10	45655-11	45655-12
Vanadium (6010)					
Vanadium (6010), mg/kg dw	19	8.9	5.5	22	15
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Zinc (6010)					
Zinc (6010), mg/kg dw	49	4.4	4.0	95	340
Date Analyzed	11.02.93	11.02.93	11.02.93	11.02.93	11.02.93
Cyanide					
Cyanide, Total (9011/9012), mg/kg dw	1.2UN	1.2UN	1.1UN	1.1UN	1.1UN
Date Analyzed	10.17.93	10.17.93	10.17.93	10.17.93	10.17.93
Percent Solids, %	86	85	95	93	90

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LOG NO: 93-45675

Received: 08 OCT 93

Mr. Paul Stoddard
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5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06/CNS07/CNS09)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45675-5	CNSY/S02-B05-01	10-07-93/0820	CNS07
45675-6	CNSY/S02-B05-02	10-07-93/0840	CNS07
45675-7	CNSY/S02-B12-01	10-07-93/0930	CNS07
45675-8	CNSY/S02-B12-02	10-07-93/0945	CNS07
45675-9	CNSY/S02-B13-01	10-07-93/1415	CNS09

PARAMETER	45675-5	45675-6	45675-7	45675-8	45675-9
Aluminum (6010)					
Aluminum (6010) , mg/kg dw	5400	8300	5400	5300	1800
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Antimony (6010)					
Antimony (6010) , mg/kg dw	5.6UN	6.0UN	5.5UN	8.8UN	5.5UN
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Arsenic (7060)					
Arsenic (7060), mg/kg dw	2.1	1.5	3.6	6.1	5.2N
Date Analyzed	10.29.93	11.03.93	11.01.93	11.01.93	11.01.93
Barium (6010)					
Barium (6010), mg/kg dw	35	26	27	9.2	29
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Beryllium					
Beryllium (6010), mg/kg dw	0.56U	0.60U	0.55U	0.88U	0.55U
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.01.93
Cadmium (6010)					
Cadmium (6010), mg/kg dw	0.56U	0.60U	2.8	0.88U	0.55U
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Calcium (6010)					
Calcium (6010), mg/kg dw	570	980	32000	210000	190000
Date Analyzed	10.03.93	11.04.93	11.03.93	11.03.93	11.02.93

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LOG NO: S3-45675

Received: 08 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06/CNS07/CNS09)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45675-5	CNSY/S02-B05-01	10-07-93/0820	CNS07
45675-6	CNSY/S02-B05-02	10-07-93/0840	CNS07
45675-7	CNSY/S02-B12-01	10-07-93/0930	CNS07
45675-8	CNSY/S02-B12-02	10-07-93/0945	CNS07
5675-9	CNSY/S02-B13-01	10-07-93/1415	CNS09

PARAMETER	45675-5	45675-6	45675-7	45675-8	45675-9
Chromium (6010)					
Chromium (6010), mg/kg dw	4.6	16	18	62	13
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Cobalt (6010)					
Cobalt (6010), mg/kg dw	1.1U	1.2U	2.0	1.8U	2.4
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Copper (6010)					
Copper (6010), mg/kg dw	20	3.0U	34	13	19
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Iron (6010)					
Iron (6010), mg/kg dw	4100	8400	9800	5700	3700
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Lead (7421)					
Lead (7421), mg/kg dw	14N*	8.6N*	160N*	9.0N*	79N*
Date Analyzed	11.03.93	11.06.93	11.01.93	11.04.93	11.05.93
Magnesium (6010)					
Magnesium (6010), mg/kg dw	300N	630N	700N	8000N	3000
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Manganese (6010)					
Manganese (6010), mg/kg dw	31	8.7	46	34	350N
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45675-5	CNSY/S02-B05-01	10-07-93/0820	CNS07
45675-6	CNSY/S02-B05-02	10-07-93/0840	CNS07
45675-7	CNSY/S02-B12-01	10-07-93/0930	CNS07
45675-8	CNSY/S02-B12-02	10-07-93/0945	CNS07
45675-9	CNSY/S02-B13-01	10-07-93/1415	CNS09

PARAMETER	45675-5	45675-6	45675-7	45675-8	45675-9
Mercury					
Mercury (7470/7471), mg/kg dw	0.047	0.025	0.14	0.026	0.21
Date Analyzed	10.22.93	10.22.93	10.22.93	10.22.93	10.29.93
Nickel (6010)					
Nickel (6010), mg/kg dw	4.4U	4.8U	13	28	8.8
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Potassium (6010)					
Potassium (6010), mg/kg dw	110U	280	370	1200	160
Date Analyzed	11.01.93	1.04.93	11.01.93	11.01.93	11.02.93
Selenium (7740)					
Selenium (7740), mg/kg dw	1.1UWN	1.2UN	1.1UWN	1.8UN	1.1UWN
Date Analyzed	10.29.93	11.03.93	10.29.93	11.01.93	11.01.93
Silver (6010)					
Silver (6010), mg/kg dw	1.1UN	1.2UN	1.1UN	1.8UN	1.1U
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Sodium (6010)					
Sodium (6010) , mg/kg dw	56U	60U	720	4200	100
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Thallium (7841)					
Thallium (7841) , mg/kg dw	1.1UWN	1.2UN	1.1UWN	1.8UWN	5.5U
Date Analyzed	11.03.93	11.05.93	11.03.93	11.03.93	11.04.93

SL SAVANNAH LABORATORIES
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5102 LaRoche Avenue • Savannah, GA 31404 • (912) 354-7858 • Fax (912) 352-0165

LOG NO: 53-45675

Received: 08 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06/CNS07/CNS09)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45675-5	CNSY/S02-B05-01	10-07-93/0820	CNS07
45675-6	CNSY/S02-B05-02	10-07-93/0840	CNS07
45675-7	CNSY/S02-B12-01	10-07-93/0930	CNS07
45675-8	CNSY/S02-B12-02	10-07-93/0945	CNS07
45675-9	CNSY/S02-B13-01	10-07-93/1415	CNS09

PARAMETER	45675-5	45675-6	45675-7	45675-8	45675-9
Vanadium (6010)					
Vanadium (6010), mg/kg dw	6.8	17	19	30	6.2
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Zinc (6010)					
Zinc (6010), mg/kg dw	85	6.9	110	61	37N
Date Analyzed	11.01.93	11.04.93	11.01.93	11.01.93	11.02.93
Cyanide					
Cyanide, Total (9011/9012), mg/kg dw	1.1UN	1.2UN	1.1UN	1.8UN	1.1UN
Date Analyzed	10.17.93	10.17.93	10.17.93	10.17.93	10.17.93
Percent Solids, %	90	83	91	56	91

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Project: CTO-029 (SDG CNS06/CNS07/CNS09)
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45675-10	CNSY/S02-B13-02	10-07-93/1430	CNS09
45675-11	CNSY/S02-B14-01	10-07-93/1525	CNS09

PARAMETER	45675-10	45675-11
Aluminum (6010)		
Aluminum (6010) , mg/kg dw	6200	3700
Date Analyzed	11.02.93	11.02.93
Antimony (6010)		
Antimony (6010) , mg/kg dw	7.4UN	6.1UN
Date Analyzed	11.02.93	11.02.93
Arsenic (7060)		
Arsenic (7060), mg/kg dw	5.2N	2.2N
Date Analyzed	11.02.93	11.01.93
Barium (6010)		
Barium (6010), mg/kg dw	9.0	16
Date Analyzed	11.02.93	11.02.93
Beryllium		
Beryllium (6010), mg/kg dw	0.74U	0.61U
Date Analyzed	11.02.93	11.02.93
Cadmium (6010)		
Cadmium (6010), mg/kg dw	0.74U	0.54U
Date Analyzed	11.02.93	11.02.93
Calcium (6010)		
Calcium (6010), mg/kg dw	99000	10000
Date Analyzed	11.02.93	11.02.93
Chromium (6010)		
Chromium (6010), mg/kg dw	27	6.7
Date Analyzed	11.02.93	11.02.93

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Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45675-10	CNSY/S02-B13-02	10-07-93/1430	CNS09
45675-11	CNSY/S02-B14-01	10-07-93/1525	CNS09

PARAMETER	45675-10	45675-11
Cobalt (6010)		
Cobalt (6010), mg/kg dw	1.5U	1.1U
Date Analyzed	11.02.93	11.02.93
Copper (6010)		
Copper (6010), mg/kg dw	6.1	8.9
Date Analyzed	11.02.93	11.02.93
Iron (6010)		
Iron (6010), mg/kg dw	6700	5300
Date Analyzed	11.02.93	11.02.93
Lead (7421)		
Lead (7421), mg/kg dw	3.7N*	29N*
Date Analyzed	11.04.93	11.05.93
Magnesium (6010)		
Magnesium (6010), mg/kg dw	3300	380
Date Analyzed	11.02.93	11.02.93
Manganese (6010)		
Manganese (6010), mg/kg dw	29N	24N
Date Analyzed	11.02.93	11.02.93
Mercury		
Mercury (7470/7471), mg/kg dw	0.015U	0.027
Date Analyzed	10.29.93	10.29.93
Nickel (6010)		
Nickel (6010), mg/kg dw	14	4.9U
Date Analyzed	11.02.93	11.02.93

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Received: 08 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06/CNS07/CNS09)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45675-10	CNSY/S02-B13-02	10-07-93/1430	CNS09
45675-11	CNSY/S02-B14-01	10-07-93/1525	CNS09

PARAMETER	45675-10	45675-11
Potassium (6010)		
Potassium (6010), mg/kg dw	610	130
Date Analyzed	11.02.93	11.02.93
Selenium (7740)		
Selenium (7740), mg/kg dw	1.5UWN	1.2UWN
Date Analyzed	11.01.93	11.01.93
Silver (6010)		
Silver (6010), mg/kg dw	1.5U	1.2U
Date Analyzed	11.02.93	11.02.93
Sodium (6010)		
Sodium (6010) , mg/kg dw	660	72
Date Analyzed	11.02.93	11.02.93
Thallium (7841)		
Thallium (7841) , mg/kg dw	7.4U	1.2U
Date Analyzed	11.04.93	11.04.93
Vanadium (6010)		
Vanadium (6010), mg/kg dw	19	12
Date Analyzed	11.02.93	11.02.93
Zinc (6010)		
Zinc (6010), mg/kg dw	28N	32N
Date Analyzed	11.02.93	11.02.93
Cyanide		
Cyanide, Total (9011/9012), mg/kg dw	1.5UN	1.2UN
Date Analyzed	10.17.93	10.17.93
Percent Solids, %	68	82

SL SAVANNAH LABORATORIES
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LOG NO: S3-46028

Received: 27 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS16/CNS17)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-1	CNSY/S02-B16-01	10-26-93/0810	CNS16
46028-2	CNSY/S02-B16-02	10-26-93/0815	CNS16
46028-3	CNSY/S02-B17-01	10-26-93/0835	CNS16
46028-4	CNSY/S02-B17-02	10-26-93/0845	CNS16
46028-5	CNSY/S02-B18-01	10-26-93/0900	CNS16

PARAMETER	46028-1	46028-2	46028-3	46028-4	46028-5
Aluminum (6010)					
Aluminum (6010) , mg/kg dw	4500	9500	7500	6700	1500
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Antimony (6010)					
Antimony (6010) , mg/kg dw	23N	6.0UN	5.7UN	8.3UN	8.3N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Arsenic (7060)					
Arsenic (7060), mg/kg dw	2.8N	3.1N	2.3N	9.6N	20N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Barium (6010)					
Barium (6010), mg/kg dw	80N	25N	22N	13N	37N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Beryllium					
Beryllium (6010), mg/kg dw	0.57UN	0.60UN	0.57UN	0.83UN	0.56UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Cadmium (6010)					
Cadmium (6010), mg/kg dw	3.1N	6.3N	0.57UN	0.83UN	0.56UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Calcium (6010)					
Calcium (6010), mg/kg dw	53000	28000	13000	240000	68000
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93

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5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS16/CNS17)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-1	CNSY/S02-B16-01	10-26-93/0810	CNS16
46028-2	CNSY/S02-B16-02	10-26-93/0815	CNS16
46028-3	CNSY/S02-B17-01	10-26-93/0835	CNS16
46028-4	CNSY/S02-B17-02	10-26-93/0845	CNS16
46028-5	CNSY/S02-B18-01	10-26-93/0900	CNS16

PARAMETER	46028-1	46028-2	46028-3	46028-4	46028-5
Chromium (6010)					
Chromium (6010), mg/kg dw	85	18	18	58	8.2
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Cobalt (6010)					
Cobalt (6010), mg/kg dw	2.3	1.2U	1.1U	1.7U	3.3
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Copper (6010)					
Copper (6010), mg/kg dw	1500	26	9.1	21	100
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Iron (6010)					
Iron (6010), mg/kg dw	8900	14000	7400	6300	4700
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Lead (7421)					
Lead (7421), mg/kg dw	1100X	21	14	2.8	85X
Date Analyzed	11.16.93	11.12.93	11.12.93	11.12.93	11.16.93
Magnesium (6010)					
Magnesium (6010), mg/kg dw	760	490	470	6700	800
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Manganese (6010)					
Manganese (6010), mg/kg dw	82	31	25	63	55
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93

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Project: CTO-029 (SDG CNS16/CNS17)
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-1	CNSY/S02-B16-01	10-26-93/0810	CNS16
46028-2	CNSY/S02-B16-02	10-26-93/0815	CNS16
46028-3	CNSY/S02-B17-01	10-26-93/0835	CNS16
46028-4	CNSY/S02-B17-02	10-26-93/0845	CNS16
46028-5	CNSY/S02-B18-01	10-26-93/0900	CNS16

PARAMETER	46028-1	46028-2	46028-3	46028-4	46028-5
Mercury					
Mercury (7470/7471), mg/kg dw	0.98	0.039	0.015	0.017U	0.28
Date Analyzed	11.10.93	11.05.93	11.05.93	11.05.93	11.10.93
Nickel (6010)					
Nickel (6010), mg/kg dw	22N	6.4N	4.5UN	28N	9.8N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Potassium (6010)					
Potassium (6010), mg/kg dw	250N	340N	370N	1400N	280N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Selenium (7740)					
Selenium (7740), mg/kg dw	1.1UWN	1.2UWN	5.7UWN	1.7UWN	1.1UN
Date Analyzed	11.06.93	11.06.93	11.09.93	11.09.93	11.06.93
Silver (6010)					
Silver (6010), mg/kg dw	1.1UN	1.2UN	1.1UN	1.7UN	1.1UN
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Sodium (6010)					
Sodium (6010) , mg/kg dw	57UN	60UN	98N	940N	94N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Thallium (7841)					
Thallium (7841) , mg/kg dw	1.1U	1.2U	1.8U	1.7UW	1.1U
Date Analyzed	11.15.93	11.15.93	11.15.93	11.15.93	11.15.93

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Purchase Order: 041100/93

Project: CTO-029 (SDG CNS16/CNS17)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-1	CNSY/S02-B16-01	10-26-93/0810	CNS16
46028-2	CNSY/S02-B16-02	10-26-93/0815	CNS16
46028-3	CNSY/S02-B17-01	10-26-93/0835	CNS16
46028-4	CNSY/S02-B17-02	10-26-93/0845	CNS16
46028-5	CNSY/S02-B18-01	10-26-93/0900	CNS16

PARAMETER	46028-1	46028-2	46028-3	46028-4	46028-5
Vanadium (6010)					
Vanadium (6010), mg/kg dw	18	24	15	31	9.0
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Zinc (6010)					
Zinc (6010), mg/kg dw	1100	92	10	83	71
Date Analyzed	11.09.93	11.09.93	11.09.93	11.09.93	11.09.93
Cyanide					
Cyanide, Total (9011/9012), mg/kg dw	1.1UN	1.2UN	1.1UN	1.7UN	1.1UN
Date Analyzed	11.07.93	11.07.93	11.07.93	11.07.93	11.07.93
Percent Solids, %	87	84	88	60	89

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-6	CNSY/S02-B18-02	10-26-93/0910	CNS16
46028-7	CNSY/S02-B19-01	10-26-93/1115	CNS16
46028-8	CNSY/S02-B19-02	10-26-93/1120	CNS16
46028-9	CNSY/S02-B20-01	10-26-93/1130	CNS17
46028-10	CNSY/S02-B20-02	10-26-93/1140	CNS17

PARAMETER	46028-6	46028-7	46028-8	46028-9	46028-10
Aluminum (6010)					
Aluminum (6010) , mg/kg dw	5500	6500	5100	3400	4800
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Antimony (6010)					
Antimony (6010) , mg/kg dw	6.8UN	5.4UN	5.6UN	5.8UN*	6.0UN*
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Arsenic (7060)					
Arsenic (7060), mg/kg dw	6.2N	1.3N	1.3N	4.1	3.3
Date Analyzed	11.09.93	11.10.93	11.09.93	11.06.93	11.08.93
Barium (6010)					
Barium (6010), mg/kg dw	10N	13N	17N	14	15
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Beryllium					
Beryllium (6010), mg/kg dw	0.68UN	0.54UN	0.56UN	0.58U	0.60U
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Cadmium (6010)					
Cadmium (6010), mg/kg dw	0.68UN	0.54UN	0.56UN	0.58U	0.60U
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Calcium (6010)					
Calcium (6010), mg/kg dw	190000	3800	2200	200000	4600
Date Analyzed	11.09.93	11.09.93	11.09.93	11.16.93	11.16.93

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Purchase Order: 041100/93

Project: CTO-029 (SDG CNS16/CNS17)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-6	CNSY/S02-B18-02	10-26-93/0910	CNS16
46028-7	CNSY/S02-B19-01	10-26-93/1115	CNS16
46028-8	CNSY/S02-B19-02	10-26-93/1120	CNS16
46028-9	CNSY/S02-B20-01	10-26-93/1130	CNS17
46028-10	CNSY/S02-B20-02	10-26-93/1140	CNS17

PARAMETER	46028-6	46028-7	46028-8	46028-9	46028-10
Chromium (6010)					
Chromium (6010), mg/kg dw	39	9.4	9.2	16N	15N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Cobalt (6010)					
Cobalt (6010), mg/kg dw	1.4U	1.1U	1.1U	1.2U	1.2U
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Copper (6010)					
Copper (6010), mg/kg dw	10	2.8	2.8U	6.9	3.7
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Iron (6010)					
Iron (6010), mg/kg dw	4500	7400	7000	5900	16000
Date Analyzed	11.09.93	11.09.93	11.09.93	11.16.93	11.16.93
Lead (7421)					
Lead (7421), mg/kg dw	3.7	14	4.9	8.6	5.6
Date Analyzed	11.12.93	11.12.93	11.12.93	11.16.93	11.16.93
Magnesium (6010)					
Magnesium (6010), mg/kg dw	4500	280	310	5300	530
Date Analyzed	11.09.93	11.09.93	11.09.93	11.16.93	11.16.93
Manganese (6010)					
Manganese (6010), mg/kg dw	31	13	48	81	66
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-6	CNSY/S02-B18-02	10-26-93/0910	CNS16
46028-7	CNSY/S02-B19-01	10-26-93/1115	CNS16
46028-8	CNSY/S02-B19-02	10-26-93/1120	CNS16
46028-9	CNSY/S02-B20-01	10-26-93/1130	CNS17
46028-10	CNSY/S02-B20-02	10-26-93/1140	CNS17

PARAMETER	46028-6	46028-7	46028-8	46028-9	46028-10
Mercury					
Mercury (7470/7471), mg/kg dw	0.014U	0.017	0.018	0.022N	0.026N
Date Analyzed	11.05.93	11.05.93	11.05.93	11.08.93	11.08.93
Nickel (6010)					
Nickel (6010), mg/kg dw	14N	4.3UN	4.5UN	8.8	4.8U
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Potassium (6010)					
Potassium (6010), mg/kg dw	740N	190N	170N	320	210
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Selenium (7740)					
Selenium (7740), mg/kg dw	1.4UWN	1.1UWN	1.1UWN	1.2UWN	1.2UWN
Date Analyzed	11.09.93	11.06.93	11.06.93	11.08.93	11.08.93
Silver (6010)					
Silver (6010), mg/kg dw	1.4UN	1.1UN	1.1UN	1.2U	1.2U
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Sodium (6010)					
Sodium (6010) , mg/kg dw	960N	54UN	56UN	250	330
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Thallium (7841)					
Thallium (7841) , mg/kg dw	1.4UW	1.1U	1.1U	5.8U	1.2UW
Date Analyzed	11.15.93	11.15.93	11.15.93	11.16.93	11.16.93

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION . SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-6	CNSY/S02-B18-02	10-26-93/0910	CNS16
46028-7	CNSY/S02-B19-01	10-26-93/1115	CNS16
46028-8	CNSY/S02-B19-02	10-26-93/1120	CNS16
46028-9	CNSY/S02-B20-01	10-26-93/1130	CNS17
46028-10	CNSY/S02-B20-02	10-26-93/1140	CNS17

PARAMETER	46028-6	46028-7	46028-8	46028-9	46028-10
Vanadium (6010)					
Vanadium (6010), mg/kg dw	22	14	13	12N*	20N*
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Zinc (6010)					
Zinc (6010), mg/kg dw	33	6.2	6.7	22N	11N
Date Analyzed	11.09.93	11.09.93	11.09.93	11.11.93	11.11.93
Cyanide					
Cyanide, Total (9011/9012), mg/kg dw	1.4UN	1.1UN	1.1UN	1.2U	1.2U
Date Analyzed	11.07.93	11.07.93	11.07.93	11.07.93	11.07.93
Percent Solids, %	73	93	89	86	84

SAVANNAH LABORATORIES
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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-11	CNSY/S02-B21-01	10-26-93/1145	CNS17
46028-12	CNSY/S02-B21-02	10-26-93/1155	CNS17
46028-13	CNSY/S02-B22-01	10-26-93/1200	CNS17
46028-14	CNSY/S02-B22-02	10-26-93/1210	CNS17
46028-15	CNSY/S02-B23-01	10-26-93/1215	CNS17

PARAMETER	46028-11	46028-12	46028-13	46028-14	46028-15
Aluminum (6010)					
Aluminum (6010) , mg/kg dw	1300	9500	3000	6600	2800
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Antimony (6010)					
Antimony (6010) , mg/kg dw	6.1UN*	5.8UN*	5.4UN*	5.6UN*	5.2UN*
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Arsenic (7060)					
Arsenic (7060), mg/kg dw	9.9	1.5	4.6	1.8	1.0U
Date Analyzed	11.08.93	11.08.93	11.06.93	11.06.93	11.06.93
Barium (6010)					
Barium (6010), mg/kg dw	160	16	18	58	3.6
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Beryllium					
Beryllium (6010), mg/kg dw	0.61U	0.58U	0.54U	0.56U	0.52U
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Cadmium (6010)					
Cadmium (6010), mg/kg dw	1.0	0.58U	0.54U	0.56U	0.52U
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Calcium (6010)					
Calcium (6010), mg/kg dw	9900	1200	78000	13000	7200
Date Analyzed	11.16.93	11.16.93	11.16.93	11.16.93	11.16.93

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5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS16/CNS17)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-11	CNSY/S02-B21-01	10-26-93/1145	CNS17
46028-12	CNSY/S02-B21-02	10-26-93/1155	CNS17
46028-13	CNSY/S02-B22-01	10-26-93/1200	CNS17
46028-14	CNSY/S02-B22-02	10-26-93/1210	CNS17
46028-15	CNSY/S02-B23-01	10-26-93/1215	CNS17

PARAMETER	46028-11	46028-12	46028-13	46028-14	46028-15
Chromium (6010)					
Chromium (6010), mg/kg dw	5.0N	12N	7.9N	5.9N	5.9N
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Cobalt (6010)					
Cobalt (6010), mg/kg dw	1.5	1.2U	1.1U	1.9	1.4
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Copper (6010)					
Copper (6010), mg/kg dw	20	3.0	11	3.8	2.6U
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Iron (6010)					
Iron (6010), mg/kg dw	6600	12000	5200	5000	1900
Date Analyzed	11.16.93	11.16.93	11.16.93	11.16.93	11.16.93
Lead (7421)					
Lead (7421), mg/kg dw	480X	5.9	28	4.6	1.0
Date Analyzed	11.11.93	11.16.93	11.16.93	11.16.93	11.16.93
Magnesium (6010)					
Magnesium (6010), mg/kg dw	200	160	1000	630	420
Date Analyzed	11.16.93	11.16.93	11.16.93	11.16.93	11.16.93
Manganese (6010)					
Manganese (6010), mg/kg dw	15	11	25	260	11
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93

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LOG NO: S3-46028

Received: 27 OCT 93

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Purchase Order: 041100/93

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-11	CNSY/S02-B21-01	10-26-93/1145	CNS17
46028-12	CNSY/S02-B21-02	10-26-93/1155	CNS17
46028-13	CNSY/S02-B22-01	10-26-93/1200	CNS17
46028-14	CNSY/S02-B22-02	10-26-93/1210	CNS17
46028-15	CNSY/S02-B23-01	10-26-93/1215	CNS17

PARAMETER	46028-11	46028-12	46028-13	46028-14	46028-15
Mercury					
Mercury (7470/7471), mg/kg dw	0.41N	0.076N	0.046N	0.028N	0.010UN
Date Analyzed	11.10.93	11.08.93	11.08.93	11.08.93	11.08.93
Nickel (6010)					
Nickel (6010), mg/kg dw	5.8	4.7U	4.3U	4.4U	4.2U
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Potassium (6010)					
Potassium (6010), mg/kg dw	120U	240	180	170	100U
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.983
Selenium (7740)					
Selenium (7740), mg/kg dw	1.2UWN	1.2UWN	1.1UWN	1.1UWN	1.0UWN
Date Analyzed	11.08.93	11.08.93	11.08.93	11.09.93	11.08.93
Silver (6010)					
Silver (6010), mg/kg dw	1.2U	1.2U	1.1U	1.1U	1.0U
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Sodium (6010)					
Sodium (6010) , mg/kg dw	61U	100	96	210	52U
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Thallium (7841)					
Thallium (7841) , mg/kg dw	1.2UW	1.2UW	1.1U	1.1U	1.0UW
Date Analyzed	11.16.93	11.16.93	11.16.93	11.16.93	11.16.93

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46028-11	CNSY/S02-B21-01	10-26-93/1145	CNS17
46028-12	CNSY/S02-B21-02	10-26-93/1155	CNS17
46028-13	CNSY/S02-B22-01	10-26-93/1200	CNS17
46028-14	CNSY/S02-B22-02	10-26-93/1210	CNS17
46028-15	CNSY/S02-B23-01	10-26-93/1215	CNS17

PARAMETER	46028-11	46028-12	46028-13	46028-14	46028-15
Vanadium (6010)					
Vanadium (6010), mg/kg dw	4.9N*	22N*	11N*	8.2N*	3.1N*
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Zinc (6010)					
Zinc (6010), mg/kg dw	36N	10N	32N	11N	5.8N
Date Analyzed	11.11.93	11.11.93	11.11.93	11.11.93	11.11.93
Cyanide					
Cyanide, Total (9011/9012), mg/kg dw	1.2U	1.2U	1.1U	1.1U	1.0U
Date Analyzed	11.07.93	11.07.93	11.08.93	11.07.93	11.07.93
Percent Solids, %	82	86	92	90	96

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
46028-16	CNSY/S02-B23-02	10-26-93/12225	CNS17

PARAMETER	46028-16
Aluminum (6010)	
Aluminum (6010) , mg/kg dw	5700
Date Analyzed	11.11.93
Antimony (6010)	
Antimony (6010) , mg/kg dw	8.5UN*
Date Analyzed	11.11.93
Arsenic (7060)	
Arsenic (7060), mg/kg dw	6.1
Date Analyzed	11.12.93
Barium (6010)	
Barium (6010), mg/kg dw	9.1
Date Analyzed	11.11.93
Beryllium	
Beryllium (6010), mg/kg dw	0.85U
Date Analyzed	11.11.93
Cadmium (6010)	
Cadmium (6010), mg/kg dw	0.85U
Date Analyzed	11.11.93
Calcium (6010)	
Calcium (6010), mg/kg dw	240000
Date Analyzed	11.16.93
Chromium (6010)	
Chromium (6010), mg/kg dw	66N
Date Analyzed	11.11.93

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46028-16	CNSY/S02-B23-02	10-26-93/12225	CNS17

PARAMETER	46028-16
Cobalt (6010)	
Cobalt (6010), mg/kg dw	1.7U
Date Analyzed	11.11.93
Copper (6010)	
Copper (6010), mg/kg dw	15
Date Analyzed	11.11.93
Iron (6010)	
Iron (6010), mg/kg dw	6100
Date Analyzed	11.16.93
Lead (7421)	
Lead (7421), mg/kg dw	1.4
Date Analyzed	11.26.93
Magnesium (6010)	
Magnesium (6010), mg/kg dw	8600
Date Analyzed	11.16.93
Manganese (6010)	
Manganese (6010), mg/kg dw	32
Date Analyzed	11.11.93
Mercury	
Mercury (7470/7471), mg/kg dw	0.017UN
Date Analyzed	11.10.93
Nickel (6010)	
Nickel (6010), mg/kg dw	29
Date Analyzed	11.11.93

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46028-16	CNSY/S02-B23-02	10-26-93/12225	CNS17

PARAMETER	46028-16
Potassium (6010)	
Potassium (6010), mg/kg dw	1200
Date Analyzed	11.11.93
Selenium (7740)	
Selenium (7740), mg/kg dw	3.4UWN
Date Analyzed	11.12.93
Silver (6010)	
Silver (6010), mg/kg dw	1.7U
Date Analyzed	11.11.93
Sodium (6010)	
Sodium (6010) , mg/kg dw	590
Date Analyzed	11.11.93
Thallium (7841)	
Thallium (7841) , mg/kg dw	8.5U
Date Analyzed	11.18.93
Vanadium (6010)	
Vanadium (6010), mg/kg dw	32N*
Date Analyzed	11.11.93
Zinc (6010)	
Zinc (6010), mg/kg dw	64N
Date Analyzed	11.11.93
Cyanide	
Cyanide, Total (9011/9012), mg/kg dw	1.7U
Date Analyzed	11.07.93
Percent Solids, %	59

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-3	CNSY/S02-B06-01	10-06-93/0900	CNS07
45655-4	CNSY/S02-B06-02	10-06-93/0915	CNS07
45655-5	CNSY/S02-B07-01	10-06-93/0935	CNS07
45655-6	CNSY/S02-B07-02	10-06-93/0945	CNS07
45655-7	CNSY/S02-B08-01	10-06-93/1015	CNS07

PARAMETER	45655-3	45655-4	45655-5	45655-6	45655-7
Aluminum (6010)					
Aluminum (6010) , mg/kg dw	8200	4200	5700	4500	3000
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Antimony (6010)					
Antimony (6010) , mg/kg dw	6.1UN	6.3UN	5.6UN	6.4UN	5.9UN
Date Analyzed	11.01.93	11.01.93	11.02.93	11.02.93	11.02.93
Arsenic (7060)					
Arsenic (7060), mg/kg dw	3.9	3.6	7.1	2.7	8.4
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Barium (6010)					
Barium (6010), mg/kg dw	22	14	43	11	22
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Beryllium					
Beryllium (6010), mg/kg dw	0.61U	0.63U	0.56U	0.64U	0.59U
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Cadmium (6010)					
Cadmium (6010), mg/kg dw	0.80	0.63U	4.0	0.64U	0.76
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Calcium (6010)					
Calcium (6010), mg/kg dw	75000	6900	98000	45000	140000
Date Analyzed	11.03.93	11.03.93	11.03.93	11.03.93	11.03.93

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45655-3	CNSY/S02-B06-01	10-06-93/0900	CNS07
45655-4	CNSY/S02-B06-02	10-06-93/0915	CNS07
45655-5	CNSY/S02-B07-01	10-06-93/0935	CNS07
45655-6	CNSY/S02-B07-02	10-06-93/0945	CNS07
45655-7	CNSY/S02-B08-01	10-06-93/1015	CNS07

PARAMETER	45655-3	45655-4	45655-5	45655-6	45655-7
Chromium (6010)					
Chromium (6010), mg/kg dw	25	7.6	29	17	18
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Cobalt (6010)					
Cobalt (6010), mg/kg dw	1.4	1.5	2.8	1.3U	2.4
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Copper (6010)					
Copper (6010), mg/kg dw	13	6.4	75	6.3	12
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Iron (6010)					
Iron (6010), mg/kg dw	7100	5500	8200	4600	5300
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Lead (7421)					
Lead (7421), mg/kg dw	44N*	40N*	310N*	23N*	39N*
Date Analyzed	11.01.93	11.03.93	11.01.93	11.03.93	11.03.93
Magnesium (6010)					
Magnesium (6010), mg/kg dw	2400N	660N	1900N	1900N	2100N
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Manganese (6010)					
Manganese (6010), mg/kg dw	41	130	81	44	140
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93

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45655-3	CNSY/S02-B06-01	10-06-93/0900	CNS07
45655-4	CNSY/S02-B06-02	10-06-93/0915	CNS07
45655-5	CNSY/S02-B07-01	10-06-93/0935	CNS07
45655-6	CNSY/S02-B07-02	10-06-93/0945	CNS07
45655-7	CNSY/S02-B08-01	10-06-93/1015	CNS07

PARAMETER	45655-3	45655-4	45655-5	45655-6	45655-7
Mercury					
Mercury (7470/7471), mg/kg dw	0.040	0.059	0.062	0.026	0.030
Date Analyzed	10.22.93	10.22.93	10.22.93	10.22.93	10.22.93
Nickel (6010)					
Nickel (6010), mg/kg dw	12	5.1U	18	8.3	13
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Potassium (6010)					
Potassium (6010), mg/kg dw	470	370	500	460	260
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Selenium (7740)					
Selenium (7740), mg/kg dw	1.2UWN	1.3UWN	1.1UWN	1.3UWN	1.2UWN
Date Analyzed	10.29.93	10.29.93	10.29.93	10.29.93	10.29.93
Silver (6010)					
Silver (6010), mg/kg dw	1.2UN	1.3UN	1.1UN	1.3UN	1.2UN
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Sodium (6010)					
Sodium (6010) , mg/kg dw	270	79	220	260	140
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Thallium (7841)					
Thallium (7841) , mg/kg dw	1.2UWN	1.3UWN	1.1UWN	1.3UWN	5.9UN
Date Analyzed	11.03.93	11.03.93	11.03.93	11.03.93	11.03.93

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45655-4	CNSY/S02-B06-02	10-06-93/0915	CNS07
45655-5	CNSY/S02-B07-01	10-06-93/0935	CNS07
45655-6	CNSY/S02-B07-02	10-06-93/0945	CNS07
45655-7	CNSY/S02-B08-01	10-06-93/1015	CNS07

PARAMETER	45655-3	45655-4	45655-5	45655-6	45655-7
Vanadium (6010)					
Vanadium (6010), mg/kg dw	20	12	20	15	11
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Zinc (6010)					
Zinc (6010), mg/kg dw	61	29	290	26	41
Date Analyzed	11.01.93	11.01.93	11.02.93	11.02.93	11.02.93
Cyanide					
Cyanide, Total (9011/9012), mg/kg dw	1.2UN	1.3UN	1.1UN	1.3UN	1.2UN
Date Analyzed	10.17.93	10.17.93	10.17.93	10.17.93	10.17.93
Percent Solids, %	82	79	89	78	88

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45655-13	CNSY/S02-B09-02	10-06-93/1355	CNS07
45655-14	CNSY/S02-B10-01	10-06-93/1440	CNS07
45655-15	CNSY/S02-B10-02	10-06-93/1450	CNS07
45655-16	CNSY/S02-B11-01	10-06-93/1540	CNS07
45655-17	CNSY/S02-B11-02	10-06-93/1600	CNS07

PARAMETER	45655-13	45655-14	45655-15	45655-16	45655-17
Aluminum (6010)					
Aluminum (6010) , mg/kg dw	5700	8300	5800	4400	5600
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Antimony (6010)					
Antimony (6010) , mg/kg dw	6.0UN	6.2UN	7.5UN	40N	6.5UN
Date Analyzed	11.02.93	11.02.93	11.02.93	11.01.93	11.01.93
Arsenic (7060)					
Arsenic (7060), mg/kg dw	4.1	12	7.8	20	2.4
Date Analyzed	11.02.93	11.01.93	11.02.93	11.01.93	10.29.93
Barium (6010)					
Barium (6010), mg/kg dw	18	22	14	98	10
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Beryllium					
Beryllium (6010), mg/kg dw	0.60U	0.62U	0.75U	0.66U	0.65U
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Cadmium (6010)					
Cadmium (6010), mg/kg dw	0.60U	0.62U	0.75U	7.8	0.65U
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Calcium (6010)					
Calcium (6010), mg/kg dw	96000	110000	180000	86000	1200
Date Analyzed	11.03.93	11.03.93	11.03.93	11.03.93	11.03.93

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Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06/CNS07)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-13	CNSY/S02-B09-02	10-06-93/1355	CNS07
45655-14	CNSY/S02-B10-01	10-06-93/1440	CNS07
45655-15	CNSY/S02-B10-02	10-06-93/1450	CNS07
45655-16	CNSY/S02-B11-01	10-06-93/1540	CNS07
45655-17	CNSY/S02-B11-02	10-06-93/1600	CNS07

PARAMETER	45655-13	45655-14	45655-15	45655-16	45655-17
Chromium (6010)					
Chromium (6010), mg/kg dw	15	36	53	84	6.9
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Cobalt (6010)					
Cobalt (6010), mg/kg dw	1.2	1.9	1.7	5.3	1.3U
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Copper (6010)					
Copper (6010), mg/kg dw	4.2	17	17	140	3.2U
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Iron (6010)					
Iron (6010), mg/kg dw	4400	7700	5600	30000	4400
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Lead (7421)					
Lead (7421), mg/kg dw	12N*	40N*	18N*	1600N*	20N*
Date Analyzed	11.04.93	11.04.93	11.04.93	11.01.93	11.04.93
Magnesium (6010)					
Magnesium (6010), mg/kg dw	1200N	3500N	6700N	2500N	200N
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Manganese (6010)					
Manganese (6010), mg/kg dw	45	48	53	250	7.8
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93

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LOG NO: S3-45655

Received: 07 OCT 93

Mr. Paul Stoddard
EnSafe/Allen & Hoshall
5720 Summer Trees Dr. Suite 8
Memphis, TN 38134

Purchase Order: 041100/93

Project: CTO-029 (SDG CNS06/CNS07)
Sampled By: Client

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-13	CNSY/S02-B09-02	10-06-93/1355	CNS07
45655-14	CNSY/S02-B10-01	10-06-93/1440	CNS07
45655-15	CNSY/S02-B10-02	10-06-93/1450	CNS07
45655-16	CNSY/S02-B11-01	10-06-93/1540	CNS07
45655-17	CNSY/S02-B11-02	10-06-93/1600	CNS07

PARAMETER	45655-13	45655-14	45655-15	45655-16	45655-17
Mercury					
Mercury (7470/7471), mg/kg dw	0.022	0.043	0.033	15	0.074
Date Analyzed	10.22.93	10.22.93	10.28.93	10.28.93	10.22.93
Nickel (6010)					
Nickel (6010), mg/kg dw	9.2	19	26	36	5.2U
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Potassium (6010)					
Potassium (6010), mg/kg dw	280	680	940	390	170
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Selenium (7740)					
Selenium (7740), mg/kg dw	1.2UWN	1.2UWN	3.0UWN	1.3UWN	1.3UWN
Date Analyzed	10.29.93	10.29.93	11.01.93	10.29.93	10.29.93
Silver (6010)					
Silver (6010), mg/kg dw	1.2UN	1.2UN	1.5UN	1.3UN	1.3UN
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Sodium (6010)					
Sodium (6010) , mg/kg dw	350	390	750	150	65U
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Thallium (7841)					
Thallium (7841) , mg/kg dw	1.2UWN	1.2UWN	7.5UN	1.3UWN	1.3UWN
Date Analyzed	11.03.93	11.03.93	11.03.93	11.03.93	11.03.93

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45655-14	CNSY/S02-B10-01	10-06-93/1440	CNS07
45655-15	CNSY/S02-B10-02	10-06-93/1450	CNS07
45655-16	CNSY/S02-B11-01	10-06-93/1540	CNS07
45655-17	CNSY/S02-B11-02	10-06-93/1600	CNS07

PARAMETER	45655-13	45655-14	45655-15	45655-16	45655-17
Vanadium (6010)					
Vanadium (6010), mg/kg dw	12	27	31	19	10
Date Analyzed	11.01.93	11.01.93	11.01.93	11.01.93	11.01.93
Zinc (6010)					
Zinc (6010), mg/kg dw	22	72	66	1200	11
Date Analyzed	11.02.93	11.02.93	11.02.93	11.01.93	11.01.93
Cyanide					
Cyanide, Total (9011/9012), mg/kg dw	1.2UN	1.2UN	1.5UN	1.3UN	1.3UN
Date Analyzed	10.17.93	10.17.93	10.17.93	10.17.93	10.17.93
Percent Solids, %	84	81	67	76	77

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LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-18	CNSY/S02-B04-02	10-06-93/1625	CNS07

PARAMETER	45655-18
Aluminum (6010)	
Aluminum (6010) , mg/kg dw	8100
Date Analyzed	11.01.93
Antimony (6010)	
Antimony (6010) , mg/kg dw	5.8UN
Date Analyzed	11.01.93
Arsenic (7060)	
Arsenic (7060), mg/kg dw	4.8
Date Analyzed	10.29.93
Barium (6010)	
Barium (6010), mg/kg dw	15
Date Analyzed	11.01.93
Beryllium	
Beryllium (6010), mg/kg dw	0.58U
Date Analyzed	11.01.93
Cadmium (6010)	
Cadmium (6010), mg/kg dw	0.58U
Date Analyzed	11.01.93
Calcium (6010)	
Calcium (6010), mg/kg dw	3700
Date Analyzed	11.03.93
Chromium (6010)	
Chromium (6010), mg/kg dw	12
Date Analyzed	11.01.93

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LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	SDG#
45655-18	CNSY/S02-B04-02	10-06-93/1625	CNS07

PARAMETER	45655-18
Cobalt (6010)	
Cobalt (6010), mg/kg dw	1.2U
Date Analyzed	11.01.93
Copper (6010)	
Copper (6010), mg/kg dw	3.0U
Date Analyzed	11.01.93
Iron (6010)	
Iron (6010), mg/kg dw	13000
Date Analyzed	11.01.93
Lead (7421)	
Lead (7421), mg/kg dw	34N*
Date Analyzed	11.01.93
Magnesium (6010)	
Magnesium (6010), mg/kg dw	320N
Date Analyzed	11.01.93
Manganese (6010)	
Manganese (6010), mg/kg dw	11
Date Analyzed	11.01.93
Mercury	
Mercury (7470/7471), mg/kg dw	0.041
Date Analyzed	10.22.93
Nickel (6010)	
Nickel (6010), mg/kg dw	4.7U
Date Analyzed	11.01.93

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45655-18	CNSY/S02-B04-02	10-06-93/1625	CNS07

PARAMETER	45655-18
Potassium (6010)	
Potassium (6010), mg/kg dw	280
Date Analyzed	11.01.93
Selenium (7740)	
Selenium (7740), mg/kg dw	1.2UWN
Date Analyzed	10.29.93
Silver (6010)	
Silver (6010), mg/kg dw	1.2UN
Date Analyzed	11.01.93
Sodium (6010)	
Sodium (6010) , mg/kg dw	130
Date Analyzed	11.01.93
Thallium (7841)	
Thallium (7841) , mg/kg dw	1.2UWN
Date Analyzed	11.03.93
Vanadium (6010)	
Vanadium (6010), mg/kg dw	22
Date Analyzed	11.01.93
Zinc (6010)	
Zinc (6010), mg/kg dw	8.3
Date Analyzed	11.01.93
Cyanide	
Cyanide, Total (9011/9012), mg/kg dw	1.2UN
Date Analyzed	10.17.93
Percent Solids, %	86

APPENDIX F

TREATMENT ALTERNATIVES

Table F-1
Treatment Alternatives For Groundwater/Leachate

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implementability of controls for contaminated groundwater and leachate	Vertical barrier	Slurry wall	Trench around site or hot spot is excavated and filled with bentonite slurry.	Organic/inorganic water chemistry[d] Soil type Soil moisture Particle size distribution Porosity Hydraulic conductivity (saturated and unsaturated) Relative permeability Clay content Soil sorptive capacity Cation exchange capacity Organic carbon content Soil pH Depth to groundwater Groundwater velocity and direction Depth to aquitard (Pilot - Compatibility testing with slurry wall material)
	Groundwater collection	Vertical extraction wells	Vertical wells are used to extract contaminated groundwater.	Use of aquifer Depth to water table Direction of flow Rate of flow Hydraulic conductivity (vertical and horizontal) Effective porosity Aquifer type Hydraulic gradient Identification of recharge and discharge areas Identification of aquifer boundaries Aquitard characteristics (Pilot - slug test)
	Leachate collection	Subsurface drains	System of perforated pipe laid in trenches onsite to collect contaminated groundwater.	Use of aquifer Depth to water table Direction of flow Rate of flow Hydraulic conductivity (vertical and horizontal) Effective porosity Aquifer type Hydraulic gradient Identification of recharge and discharge areas Identification of aquifer boundaries Aquitard characteristics (Pilot - slug test)

Table F-1
Treatment Alternatives For Groundwater/Leachate

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implementability of treatments for contaminated groundwater and leachate	Chemical treatment	Ion exchange	Ion exchange is the process of exchanging selected dissolved ionic contaminants with a set of substitute ions. Ion exchangers are primarily used for recovery of dilute solutions of metals or to soften water by removing calcium and manganese.	Organic/inorganic water chemistry[d] Indicator parameters Bicarbonate Biochemical oxygen demand Calcium Chemical oxygen demand Chloride Copper Iron Magnesium Manganese Nickel Oil and grease pH Potassium Sodium Sulfate Total organic carbon (TOC) Total suspended solids Zinc
		Oxidation	Oxidation is a chemical reaction in which one or more electrons are transferred from the chemical being oxidized to an oxidizing agent. Chemical oxidation include destruction of cyanide transformation of organics to biodegradable forms, or detoxification of organics and inorganics.	Organic/inorganic water chemistry[d] Indicator parameters Bicarbonate Biochemical oxygen demand Calcium Chemical oxygen demand Chloride Copper Iron Magnesium Manganese Nickel Oil and grease pH Potassium Sodium Sulfate Total organic carbon (TOC) Total suspended solids Zinc (Pilot - reagent consumption, optimal pH, and reaction time)

Table F-1
Treatment Alternatives For Groundwater/Leachate

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implementability of controls for contaminated groundwater and leachate	Chemical treatment	Metal precipitation	Precipitation is a chemical unit process in which soluble metallic ions are removed from solution by conversion to an insoluble form. Precipitation is commonly used to treat heavy metals, phosphorus, and hardness.	Organic/inorganic water chemistry[d] Indicator parameters Bicarbonate Biochemical oxygen demand Calcium Chemical oxygen demand Chloride Copper Iron Magnesium Manganese Nickel Oil and grease pH Potassium Sodium Sulfate Total organic carbon (TOC) Total Suspended Solids Zinc (Pilot - chemical dosage, contact time, mixing rate, optimal pH, and sludge handling)
		pH adjustment	Neutralizing agents are added to adjust pH.	Indicator parameters Bicarbonate Calcium Chloride Iron Magnesium Manganese pH Potassium Sodium Sulfate Total Suspended Solids (Pilot - titration curve)

Table F-1
Treatment Alternatives For Groundwater/Leachate

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implementability of controls for contaminated groundwater and leachate	Biological treatment	Aerobic	Aerobic is the use of oxygen-utilizing micro-organisms to biodegrade contaminants.	Organic/inorganic water chemistry[d] Indicator parameters Acidity-alkalinity Biochemical oxygen demand Calcium Chemical oxygen demand Chloride Dissolved oxygen Hardness Metals, dissolved Nitrogen, ammonia Nitrogen, kjeldahl Nitrogen, nitrate-nitrite Oil and grease Organic carbon pH Phosphorus Total solids Specific conductance Sulfate Sulfide Suspended solids Temperature Volatile suspended solids
	Biological treatment	Anaerobic	Anaerobic is the use of non-oxygen-utilizing micro-organisms to biodegrade contaminants.	Organic/inorganic water chemistry[d] Indicator parameters Acidity-alkalinity Biochemical oxygen demand Calcium Chemical oxygen demand Chloride Dissolved oxygen Hardness Metals, dissolved Nitrogen, ammonia Nitrogen, kjeldahl Nitrogen, nitrate-nitrite Oil and grease Organic carbon pH Phosphorus Total solids Specific conductance Sulfate Sulfide Suspended solids Volatile suspended solids

Table F-1
Treatment Alternatives For Groundwater/Leachate

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implementability of controls for contaminated groundwater and leachate	Physical treatment	Adsorption (granular activated carbon)	Adsorption is a physical separation process in which organic and inorganic materials are removed by sorption or the attraction and accumulation of one substance on the surface of another.	Organic/inorganic water chemistry[d] Indicator parameters Acidity-alkalinity Biochemical oxygen demand Calcium Chemical oxygen demand Chloride Dissolved oxygen Hardness Iron Metals, dissolved Manganese Nitrogen, ammonia Nitrogen, kjeldahl Nitrogen, nitrate-nitrite Oil and grease Organic carbon pH Phosphorus Sulfate Sulfide Suspended solids
		Air Stripping	Stripping refers to the removal of relatively volatile components from wastewater by passage of air, steam, or other gas through the contaminated liquid. Stripping is effective in removing ammonia, chlorinated solvents, monoaromatics, and other VOCs.	Organic/inorganic water chemistry[d] Indicator parameters Acidity-alkalinity Biochemical oxygen demand Chemical oxygen demand Hardness Iron Manganese Metals, dissolved Oil and grease pH

Table F-1
Treatment Alternatives For Groundwater/Leachate

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implementability of controls for contaminated groundwater and leachate	Physical treatment	Sedimentation	Sedimentation is a physical process that removes suspended solids from a liquid matrix by gravitational settling.	Organic/inorganic water chemistry[d] Indicator parameters Acidity-alkalinity Biochemical oxygen demand Calcium Chemical oxygen demand Chloride Dissolved oxygen Hardness Iron Metals, dissolved Manganese Nitrogen, ammonia Nitrogen, kjeldahl Nitrogen, nitrate-nitrite Oil and grease Organic carbon pH Phosphorus Sulfate Sulfide Suspended solids
		Filtration	Filtration is a physical process used to remove suspended solids from wastewater and is generally proceeded by chemical precipitation and neutralization.	Organic/inorganic water chemistry[d] Indicator parameters Acidity-alkalinity Biochemical oxygen demand Calcium Chemical oxygen demand Chloride Dissolved oxygen Hardness Iron Metals, dissolved Manganese Nitrogen, ammonia Nitrogen, kjeldahl Nitrogen, nitrate-nitrite Oil and grease Organic carbon pH Phosphorus Sulfate Sulfide Suspended solids

Table F-1
Treatment Alternatives For Groundwater/Leachate

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implementability of controls for contaminated groundwater and leachate	Disposal	POTW	A chemical, physical, or biological wastewater treatment plant designed and constructed to treat municipal domestic wastewater.	Organic/inorganic water chemistry[d] Indicator parameters Acidity-alkalinity Biochemical oxygen demand Calcium Chemical oxygen demand Chloride Dissolved oxygen Hardness Iron Metals, dissolved Manganese Nitrogen, ammonia Nitrogen, kjeldahl Nitrogen, nitrate-nitrite Oil and grease Organic carbon pH Phosphorus Sulfate Sulfide Suspended solids
		RCRA TSDF	The process of chemical, physically, or biologically treating the wastewater in an offsite permitted commercial hazardous waste facility.	Organic/inorganic water chemistry[d] Indicator parameters Acidity-alkalinity Biochemical oxygen demand Calcium Chemical oxygen demand Chloride Dissolved oxygen Hardness Iron Metals, dissolved Manganese Nitrogen, ammonia Nitrogen, kjeldahl Nitrogen, nitrate-nitrite Oil and grease Organic carbon pH Phosphorus Sulfate Sulfide Suspended solids

Table F-1
Treatment Alternatives For Groundwater/Leachate

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implamentability of controls for contaminated groundwater and leachate	Disposal	Land application	The process of applying wastewater directly on the land for or to infiltration into the soil.	Depth to water table Total phosphorous Chloride Ammonia Nitrate Alkalinity pH Sodium Total dissolved solids Soil type hydraulic conductivity application rate
		Injection	The process of hydraulically placing wastewater into the aquifer using either vertical or horizontal wells.	Depth to water table Total phosphorous Chloride Ammonia Nitrate Alkalinity pH Sodium Total dissolved solids Total organic carbon Soil type hydraulic conductivity application rate (2.5 gallons/ft^2/day or 5/square root of slowest percolation rate.

[a] USEPA *Conducting Remedial Investigations/Feasibility Studies for Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Municipal Landfill Sites*, EPA/540/P-91/001, Office of Solid Waste and Emergency Response Directive 9355.3-11, February 1991

[b] 40 Code of Federal Regulations (CFR) 268 Land Disposal Restriction

[c] USEPA *CERCLA Site Discharges to POTWs Treatability Manual*, EPA/540/2-90/007, Office of Solid Waste and Emergency Response, August 1990.

[d] VOA and SVOA w/TICs, Metals, Cyanide, Pesticides, and PCBs

Table F-2
Treatment Alternatives For Hot Spots, Soil, Sediments, and Waste Materials

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implementability of controls to prevent contact or runoff	Cap	Native Soil Single Barrier Double Barrier	This is the process of placing a physical horizontal barrier across the site.	Moisture content Permeability In-Situ density Atterberg limits Grain size analysis Porosity Depth
	Excavation	Dig up	This is the process of physically removing the hot spot, soil, or waste from the site.	Organic/inorganic water chemistry[d] Moisture content Permeability In-Situ density Atterberg limits Grain size analysis Porosity Depth
	Surface Water Controls	Erosion and runon/runoff controls	System of vegetation and site grading for preventing soil erosion and stormwater runon/runoff.	Organic/inorganic water chemistry[d] Indicator parameters Acidity-alkalinity Nitrogen, ammonia Nitrogen, kjeldahl Nitrogen, nitrate-nitrite Phosphorus Suspended solids
To evaluate the feasibility and implementability of treatments for contaminated soil and contaminants	Thermal Treatment	Thermal Destruction	Thermal destruction is the process of oxidizing organic and inorganics using high temperature.	Organic/inorganic water chemistry[d] Moisture content Particle size BTU content TCLP
		Thermal Desorption	Thermal desorption is the process of using low temperature to volatilize organics and inorganics from a solid matrix.	Organic/inorganic water chemistry[d] Moisture content Particle size TCLP
To evaluate the feasibility and implementability of treatments for contaminated soil and contaminants	Biological Treatment	Aerobic	Aerobic is the use of oxygen-utilizing micro-organisms to biodegrade contaminants.	Organic/inorganic water chemistry[d] Moisture content Soil Texture Temperature pH Soil microorganisms Total nitrogen Total phosphorus Depth to groundwater Dissolved oxygen Methane Chemical oxygen Demand

Table F-2
Treatment Alternatives For Hot Spots, Soil, Sediments, and Waste Materials

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
		Anaerobic	Anaerobic is the use of non-oxygen-utilizing micro-organisms to biodegrade contaminants.	Organic/inorganic water chemistry[d] Moisture content Soil Texture Temperature pH Soil microorganisms Total nitrogen Total phosphorus Depth to groundwater Methane Chemical oxygen Demand
	Physical Treatment	Solidification/ fixation	Solidification is a physical process in which organic and inorganic materials are bound to the surface of another.	Organic/inorganic water chemistry[d] Moisture content Soil Texture Suspended Solids Bulk Density Grain size analysis Atterberg limits Cone index Unconfined Compressive strength Temperature pH
To evaluate the feasibility and implementability of treatments for contaminated soil and contaminants	Physical Treatment	Vacuum Extraction	Vacuum extraction refers to the removal of relatively volatile components from soil or waste by passage of air, steam, or other gas through the contaminated matrix. Stripping is effective in removing chlorinated solvents, monoaromatics, and other VOCs.	Organic/inorganic water chemistry[d] Moisture content Air Permeability Temperature pH Depth to groundwater

Table F-2
Treatment Alternatives For Hot Spots, Soil, Sediments, and Waste Materials

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
		Solvent Extraction	Solvent extraction is a physical separation process in which organic and inorganic materials are removed from the surface of a solid matrix to a liquid matrix.	Organic/inorganic water chemistry[d] Total Organic Carbon Total Recoverable Hydrocarbons Moisture content Soil Texture Permeability Bulk Density Grain size analysis Clay Content Temperature pH Chemical oxygen Demand Cation Exchange Capacity Depth to groundwater TCLP
	Disposal	Consolidation	This is the process of consolidating the waste, soil, and other debris in a properly designed and constructed landfill.	Organic/inorganic water chemistry[d] Moisture content Permeability In-Situ density Atterberg limits Grain size analysis Depth to Groundwater TCLP
To evaluate the feasibility and implementability of treatments for contaminated soil and contaminants (continued)	Disposal (continued)	RCRA TSDF	The process of chemical, physically, or biologically treating the contaminant, soil, and other debris in an offsite permitted commercial hazardous waste facility.	Organic/inorganic water chemistry[d] Moisture content Soil Texture Temperature pH Soil microorganisms Total nitrogen Total phosphorus Depth to groundwater Dissolved oxygen TCLP

[a] USEPA *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites*, EPA/540/P-91/001, Office of Solid Waste and Emergency Response Directive 9355.3-11, February 1991

[b] 40 Code of Federal Regulations (CFR) 268 Land Disposal Restriction

[c] USEPA *CERCLA Site Discharges to POTWs Treatability Manual*, EPA/540/2-90/007, Office of Solid Waste and Emergency Response, August 1990.

[d] VOA and SVOA w/TICs, Metals, Cyanide, Pesticides, and PCBs

Table F-3
Treatment Alternatives For Soil Gas

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implementability of controls for subsurface gas	Cap	Native Soil Single Barrier Double Barrier	This is the process of placing a physical horizontal barrier across the site.	Moisture content Permeability In-Situ density Atterberg limits Grain size analysis Porosity Depth
	Vent	Vertical Horizontal	Vertical or horizontal wells are used to vent gases.	Moisture content Air Permeability Atterberg limits Grain size analysis Porosity Depth
To evaluate the feasibility and implementability of treatments for contaminated soil and contaminants	Thermal Treatment	Thermal Destruction	Thermal destruction is the process of oxidizing organic and inorganics using high temperature.	Organic/inorganic water chemistry[d] Moisture content Particle size BTU content TCLP
		Thermal Desorption	Thermal desorption is the process of using low temperature to volatilize organics and inorganics from a solid matrix.	Organic/inorganic water chemistry[d] Moisture content Particle size BTU content TCLP
	Physical Treatment	Carbon Absorption	Adsorption is a physical separation process in which organic and inorganic materials are removed by sorption or the attraction and accumulation of one substance on the surface of another.	Organic/inorganic water chemistry (VOA and SVOA w/TICs, Pesticides, and PCBs) Moisture content Temperature Total Organic Carbon
To evaluate the feasibility and implementability of treatments for contaminated soil and contaminants (continued)	Physical Treatment (continued)	Vacuum Extraction	Vacuum extraction refers to the removal of relatively volatile components from soil or waste by passage of air, steam, or other gas through the contaminated matrix. Stripping is effective in removing chlorinated solvents, monoaromatics, and other VOCs.	Organic/inorganic water chemistry[d] Moisture content Air Permeability Temperature pH Depth to groundwater

Table F-3
Treatment Alternatives For Soil Gas

Data Quality Objective Elements	Remedial Technology[a]	Process Option[b,c]	Description	Data Quality Needs
To evaluate the feasibility and implementability of treatments for contaminated soil and contaminants	Disposal	RCRA TSDF	The process of chemical, physically, or biologically treating the contaminant in an offsite permitted commercial hazardous waste facility.	Organic/inorganic water chemistry[d] Moisture content Soil Texture Temperature pH Soil microorganisms Total nitrogen Total phosphorus Depth to groundwater Dissolved oxygen TCLP

[a] USEPA *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites*, EPA/540/P-91/001, Office of Solid Waste and Emergency Response Directive 9355.3-11, February 1991

[b] 40 Code of Federal Regulations (CFR) 268 Land Disposal Restriction

[c] USEPA *CERCLA Site Discharges to POTWs Treatability Manual*, EPA/540/2-90/007, Office of Solid Waste and Emergency Response, August 1990.

[d] VOA and SVOA w/TICs, Metals, Cyanide, Pesticides, and PCBs

APPENDIX G

DIRECTIONS TO THE PRIMARY MEDICAL FACILITY

DIRECTIONS TO THE NEAREST MEDICAL FACILITY

Baker Hospital
Baker Hospital Blvd.
Charleston, South Carolina

General Telephone Number - (803) 744-2110
Emergency Room Telephone Number - (803) 744-2110

Directions to BAKER HOSPITAL from the Main Gate of the Charleston Naval Shipyard:

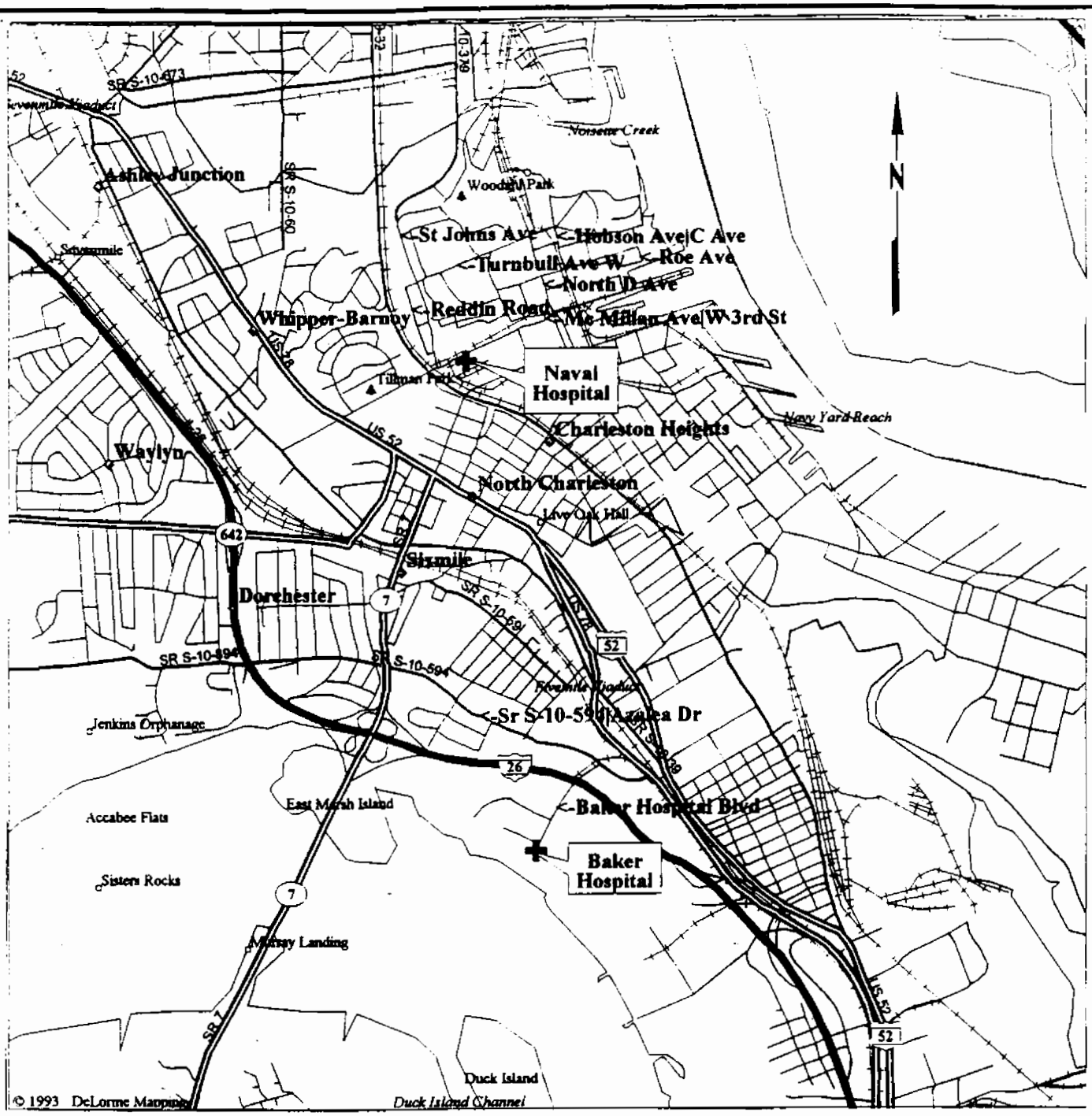
(1) After exiting the Main Gate (McMillan Gate) continue west on McMillan to US Highway 52.

(2) Turn left (east) on US Highway 52 and proceed to State Route 7.

(3) Turn right (south) on State Route 7 and proceed to Interstate 26.

(4) Turn left (east) on Interstate 26 and proceed to Baker Hospital Boulevard.

(5) Turn right (south) on Baker Hospital Boulevard and proceed approximately 0.2 miles to the Baker Hospital Emergency Room.



HEALTH AND SAFETY PLAN
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

HEALTH AND SAFETY ZONE A AND B HOSPITAL DIRECTIONS

DWG DATE: 01/16/95 | DWG NAME: BOARD

APPENDIX H

FORMS

PLAN ACCEPTANCE FORM

PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the project site and returned to : EnSafe/Allen & Hoshall, Memphis Tennessee.

Job Number: 2903-08420

Contract Number: N62467-89-D-0318

Project: Zone C - Naval Base Charleston

I have read and understand the contents of the above plan and agree to perform my work in accordance with it.

_____

Signed

_____

Print Name

_____

Company

_____

Date

EMPLOYEE EXPOSURE HISTORY FORM

Employee: _____

Job Name: _____

Date(s) From/To: _____

Hours Onsite: _____

Contaminants (Suspected/Reported):

_____

_____

_____

_____

_____

_____

_____

(See Attached Laboratory Analysis)

PLAN FEEDBACK FORM

Problems with plan requirements:

Unexpected situations encountered:

Recommendations for revisions: